MECHANICAL
ENGINEERING

Technology that moves the world

THE MAGAZINE OF ASME

No. 11
137

WEAK LINKS MADE STRONGER

EFFECTIVE SUPPLY CHAINS—ESSENTIAL FOR SUCCESS IN DEVELOPING MARKETS—POSE CHALLENGES OF THEIR OWN.

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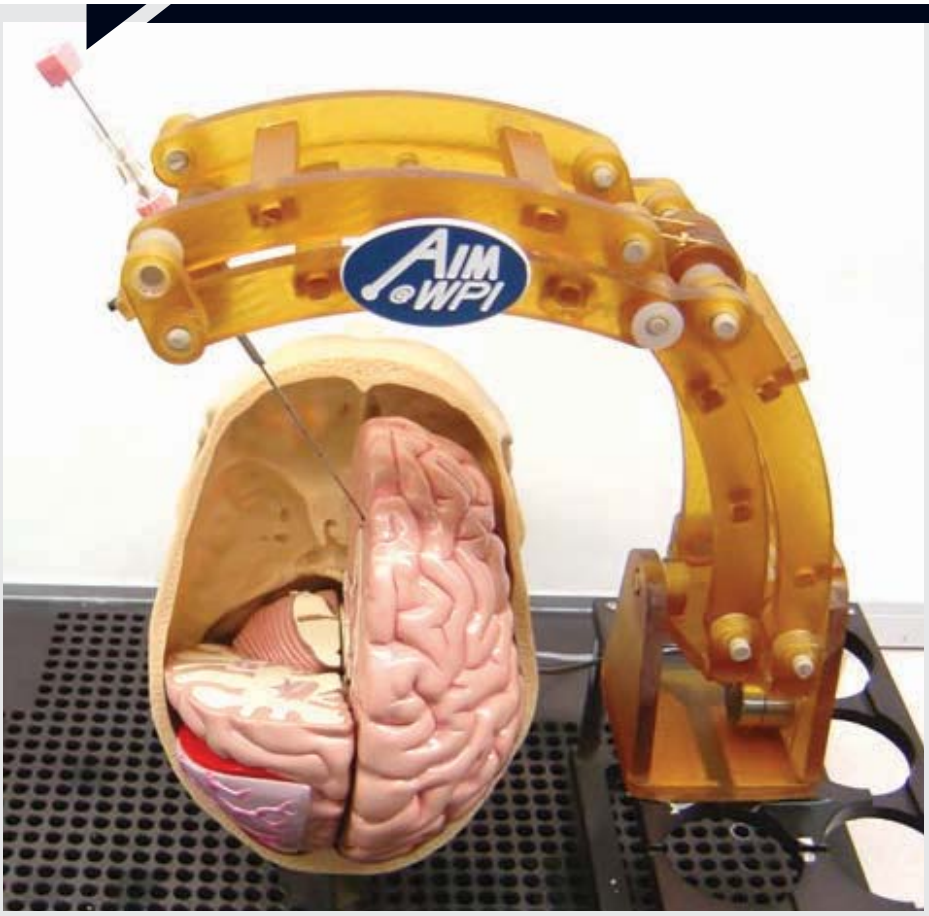
NOVEMBER 2015



SURGICAL ROBOT WORKS WITHIN MRI

ROBOTS HAVE STEADILY TAKEN UP RESIDENCE in the surgical suite, with surgeons adopting complex tools such as the da Vinci system to perform minimally invasive surgery. But there are limits, especially for image-guided, semi-autonomous robotics, where medical images guide a procedure. Now, researchers at Worcester Polytechnic Institute in Massachusetts have changed the mechatronics for a robot to allow it to fit within an MRI scanner and have used the scanner's images to perform real-time, image-guided prostate surgery.

BATTLING THE BLAZE

FIREFIGHTERS HAVE LONG BEEN among the most heroic members of society, but it would be better if they didn't have to put themselves in quite as many perilous situations. A robot firefighter just might one day be able to step in and save lives. For now, the technology is being tested at sea.

For these articles and other content, visit asme.org.

7 STEM APPS FOR STUDENTS

LIKE EVERYTHING ELSE, technology has transformed education. Mobile apps are helping to enable STEM education by making the learning experience interactive and engaging for kids.

SIMULATING THE DEAD

THE PRICE OF ACQUIRING and keeping a human cadaver for research, education, or testing is steep. But now Christopher Sakezles's synthetic cadaver, the SynDaver, is providing med schools, nursing schools, and anyone else with a need to learn about our innards, with a cheaper, reusable body.

NEXT MONTH ON ASME.ORG

VIDEO: EMERGING TECHNOLOGY AND THE ELECTRICAL GRID

The U.S. electrical grid is changing. Caren Anders, vice president of Duke Energy, talks about the evolution of an interactive two-way transmission and distribution grid incorporating emerging technologies such as renewable generation, energy storage, plug-in electric vehicles, and more.

A BETTER PILL TO SWALLOW

For millions of Americans who manage chronic health conditions with daily prescription drugs, sticking to the proper dosage instructions can be challenging. A new entry in the wearable sensor technology market could make their doctors' orders easier to follow—and to swallow.

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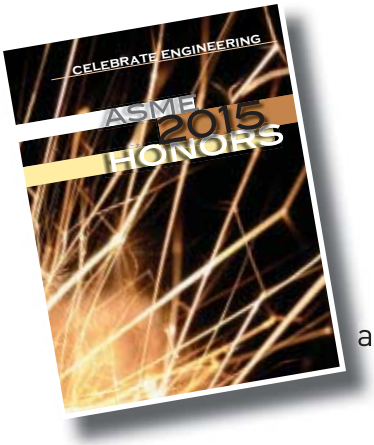
Lean design can let us make a profit while satisfying customers in the developing world.

BY DOUGLAS L. VAN BOSSUYT



A celebration of the highest achievements in engineering.

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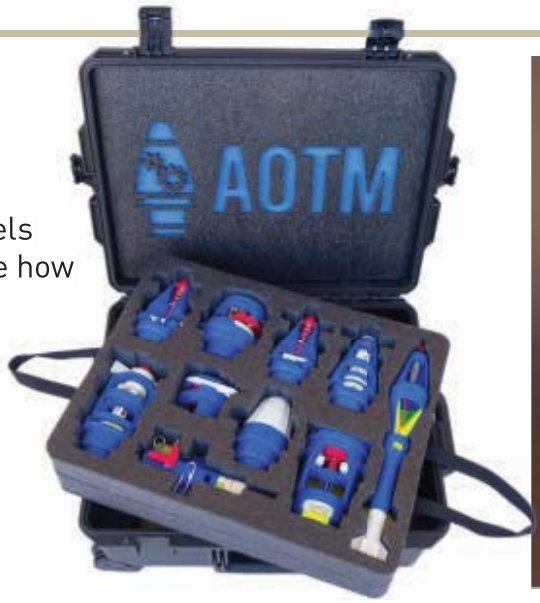
3-D printed models help teach people how to defuse bombs.

BY MELISSAE FELLET



MASTER OF FLIGHT

Hummingbirds maintain stability in turbulent conditions.

BY JAMES PERO

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Give me the place to stand, and I shall move the earth
—Archimedes

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John G. Falcioni
Editor-in-Chief

THE ROMANTICISM OF ENGINEERING

In early September, my favorite columnist, the influential David Brooks of *The New York Times*, made a pitch for more liberal arts majors and a rebirth of romanticism at a time when, he believes, many college-age kids are being force-fed more practical majors and pushed into a "mercenary direction."

He argues that parents are part of an apparatus that has arisen to make our culture more professional and less poetic. This comes at a time when transactional jobs are declining—as technology now performs many of the tasks previously handled by humans—and relational jobs are expanding.

This discourse—albeit exaggerated as viewed from my perch—serves as a sensible lead-in to a conversation about the responsibility of colleges and universities to mold holistic professionals, regardless of major, who are able to demonstrate the necessary mix of humanistic skills and the cognitive abilities associated with "hard" skills. Theater majors, for instance, need to understand basic science and engineering principles, especially as they interact outside the stage with today's technology-centric world. Much the same, engineering majors should be exposed to the writings of Bertrand Russell and to the songs of Sondheim so that their curiosities will be stimulated beyond the task of understanding mathematical formulas. When this balance is reached, great personal and professional heights are imaginable.

Successful technology innovators are able to aptly meld machines and systems with the social world. These individuals don't necessarily set out to develop transformative technologies. According to renowned author and occasional *Mechanical Engineering* contributor Henry Petroski, the breakthroughs materialize from an innovator's unique mindset that understands the nuances of multidisciplinary, multinational, and multicultural effects.

In his new book, *Applied Minds: How Engineers Think*, Guru Madhavan drives home the point that great innovations must pass the test of Petroski's tenets, as he showcases examples of the force of the engineering mindset.

A biomedical engineer, policy adviser, and researcher at the National Academy of Sciences, Madhavan reflects on Dubai's Burj Khalifa, the world's tallest building; the ketchup squeeze bottle; Microsoft's Office Suite; and Alfred Hitchcock's film *Rear Window* to make the case that these are examples of creations that were spun from an engineer's mind, crafted with singular purpose, vision, and clarity. He credits engineers for owning a unique vision and the mental tools that foster innovation and deliver creative solutions.

This month, ASME celebrates that very conceptual toolkit, as it pays tribute to those who have distinguished themselves in technology. Some who will be recognized at the Society's Honors Assembly—held during the 2015 ASME International Mechanical Engineering Congress and Exposition in Houston—are engineers; others are not.

Among the honored is Freeman A. Hrabowski III, whom we also feature in this month's One-on-One column on page 16. Hrabowski is the president of the University of Maryland, Baltimore County, and a leading U.S. voice in the advocacy of STEM education. He is also an inspiring speaker who encourages an educational environment emphasizing the necessary hard skills along with an appreciation for romanticism. This approach, he offers, maintains an innovative, democratic society. Hrabowski knows "how engineers think" because he works hand-in-hand with many, finding best ways to nurture the minds of the young and the not so young. And that's something that both liberal arts and STEM-related majors can appreciate. ME

FEEDBACK

We push for STEM curriculums in the classroom, but are we going too far? Email me.

falcionij@asme.org

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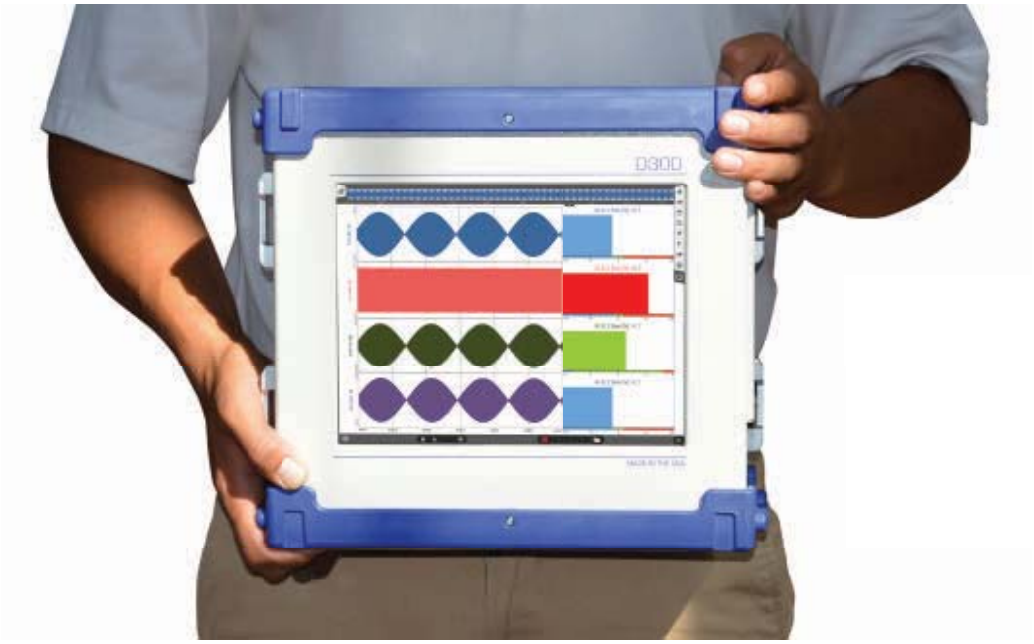

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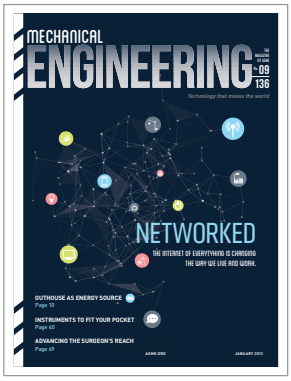


SEPTEMBER 2015

Reader Rossman recommends learning about climate science.

« A reader defends climate scientists. And in a comment, a call for open architecture for industrial components.

CLIMATE SCIENCE

To the Editor: Present climate change predictions are based upon observations, experiments, and analytic simulations. In his September letter to *Mechanical Engineering*, Douglas L. Marriott was correct when he stated, "I would expect that by now, we would have some sound basis of factual knowledge available." (This statement, excerpted from the "Letters & Comments" section was directed at climate change science.) Guess what: evidence already exists.

I suggest there are a considerable number of scholarly articles that have been written including a July 2007 *Scientific American* article entitled "Physical Science Behind Climate Change." I would also recommend reading articles and reports published by the Intergovernmental Panel on Climate Change. There's plenty of "stuff" to be found on the subject of climate change. Many of these articles are only a "Google" away.

Humanity's track record for creating adverse environmental conditions is considerable: industrial contamination of our rivers, indiscriminate use of pesticides that are killing off birds and insects that are important to our own survival, space debris that orbits our planet, oil spills that contaminate our oceans and kill aquatic life, and fracking that requires voluminous quantities of water and the use of carcinogenic chemicals that contaminate our ground water supplies.

All of these present an undisputable track record of humans causing damage to our planet's environment. With our history of self-inflicted damage to the environment, why is it so difficult to comprehend that we are a major contributors to the climate change conditions that we are experiencing?

Very much like the study of cosmology and astrophysics, climate science depends upon observations, the sampling and testing of specimens, and ultimately highly complex analytic simulations from which to arrive at conclusions. There are no "global laboratory experiments" that can be performed that will provide the absolute answers we seek. Instead, we need to rely upon predictions from a very bright, well-educated

COMMENT

THE NEXT WAVE LIFTS THE MECHANICAL

Mechanical engineering as a discipline has lost its luster in Washington. The discipline as presented to the young has moved away from its core industrial applications of economic magnitude (railroads, aircraft, ships, manufacturing, farm machinery, orthotics, etc.).

This weakness leads to an imbalance of the technologies (electricals and computer science are strong, while the mechanicals are weak). Hence, we ask for more vehicle autonomy, efficiency, safety, responsiveness, cost-effectiveness, and so on without the essential balanced contribution by the mechanicals to meet these goals. Further, the electricals have vigorously opened up their architecture to permit infusion of highly certified components (say, computer chips) supplied by a responsive supply chain to permit rapid refreshment and a constantly improving performance/cost ratio (Moore's law).

What's the equivalent in the mechanicals? The reference component technology at the correct level of granularity would be an intelligent fully integrated actuator: a prime mover, sensors, gear train, operational software, performance maps for structured decision-making in milliseconds, response to command, and so on, all produced in minimum sets for each application domain. This is largely missing in the U.S. Further, certification requires a science of metrology which is now presented as a niche technology, not one that is generic, as it is for certification of computer chips.

Given the correct set of subsystem components—sensors, actuators, standardized interfaces, operational software modules, etc.—the mechanicals could, then, pursue an open architecture for most economically relevant applications. Doing so would reduce the one-off mentality in favor of a rapid technology turnover to constantly improve performance, reduce cost, reduce time to market, enable OEMs more access to the maintenance economy, and enhance customer

community of scientists for the answers regarding climate change.

We should applaud not trivialize the science community for their efforts.

Herman Rossman, Life Member, *Owings Mills, Md.*

SEEKING JOB INFORMATION

To the Editor: I am a second-year engineering student at Harding University. I really enjoy reading your magazine and learning about recent engineering developments. It excites me and makes me anticipate getting an engineering internship/job, which brings me to the purpose of this e-mail.

I have been wondering if you produce a list of top engineering jobs in your magazine. I also subscribe to *Outside* magazine, which creates an annual list of top outdoor companies to work for. They describe the jobs in detail, mentioning things like benefits, work atmosphere and advancement opportunities. I've always enjoyed reading this list and am wondering if your magazine does anything similar.

And if not, do you have any suggestions for ways to find this sort of thing online? I have tried to find a descriptive list of top engineering jobs, but I haven't had much luck.

Davis Nossaman, *Searcy, Ark.*

FEEDBACK Send us your letters and comments via hard copy or e-mail memag@asme.org (subject line "Letters and Comments"). Please include full name, address and phone number. We reserve the right to edit for clarity, style, and length. We regret that unpublished letters cannot be acknowledged or returned.

choice and, therefore, satisfaction.

The real threat is imbalance, especially for military systems. A continuing weakness in the mechanicals will result in mission limitations easily exceeded by strong competing nations. The same will occur in emerging fields such as robotic surgery, orthotics, or hybrid vehicles.

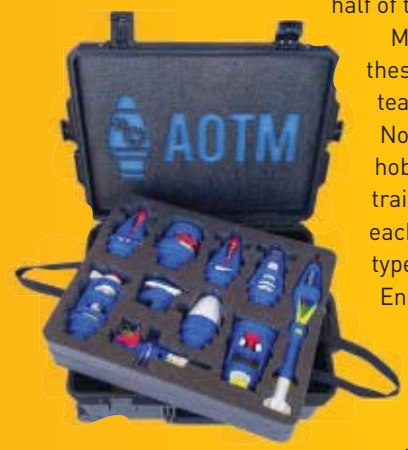
A more extensive argument is being published this month as the Next Wave of Technology, which will be presented as a plenary presentation of Track 4: Dynamics, Vibrations, Control at the IMECE/ASME Winter Annual Meeting in Houston, Nov. 13-19. **ME**

DELBERT TESAR holds the Carol Cockrell Curran chair in engineering at the University of Texas at Austin.

PRINTING TO DISARM

A U.S.-BASED CHARITY IS USING HOBBY-GRADE 3-D PRINTERS TO CREATE MODELS THAT HELP TEACH PEOPLE HOW TO DEFUSE UNEXPLODED WEAPONS.

After a war, unexploded bombs, shells, and landmines litter the land. In 2013, that legacy of mines and other explosive remnants of war killed at least 3,300 people in 52 countries around the world, according to a report published by the International Campaign to Ban Landmines, a Geneva-based coalition of non-governmental organizations. The majority of the recorded casualties from that ordnance were civilians, and when age was also known, about half of the casualties were children.



A training kit (above and right) uses 3-D models to show how different fuzes arm and fire weapons.
Images: Golden West Design Lab

Many countries train citizens to defuse these unexploded weapons, but effective teaching materials can be hard to find. Now a U.S.-based non-profit is using hobby-grade 3-D printers to produce a training kit that includes ten fuze models, each designed to show how a particular type of fuze arms and fires a weapon.

Engineers at the Golden West Humanitarian Foundation, in collaboration with professors at the Massachusetts Institute of Technology and Singapore University of Technology and Design who specialize in mechanical engineering education, also developed a classroom curriculum to pair with the models.

The models and curriculum are called the Advanced Ordnance Teaching Materials. They are designed to avoid some issues that arise in traditional training methods.

Traditional training involves lectures, animations, and detailed engineering diagrams of weapon fuzes. Students may struggle to translate blueprints into practical actions to deactivate a fuze. Some training programs have students handle deactivated weapons so they can get a better feel for how the arming and firing mechanisms work. But these delicate workings tend to disintegrate once the explosives are removed. It's also hard to obtain and transport deactivated weapons around the world.

With funding from the U.S. Department of State, Office of Weapons Removal and Abatement, Golden West engineers began designing fuze models and prototyping them using a hobby grade 3-D printer.

"I was very surprised with the build quality and accuracy of the machines," said John Wright, chief design engineer at the foundation. The group decided its printed models were durable enough to be a sellable product.

Thirteen 3-D printers, many constantly running inside the foundation's Cambodian design lab, churn

out the 144 printed parts in the model kit. The group purchases other, non-printable parts, such as LEDs, metal springs, or microprocessors. Each printed piece is hand finished, and local engineering students interning with the design team assemble the fuze models.

The final models include rotating gears, sliding firing pins, springy pressure sensors, clockwork mechanisms, and piezoelectric spark generators. One fuze arms in response to centrifugal force that spinning projectiles experience when fired.

"It's hard to teach centrifugal force unless you can see the firing pin move," Wright said. During training sessions, an external motor spins the model to generate that force.

Using hobby-grade printers instead of other manufacturing techniques helped keep the kit affordable enough for its niche humanitarian market, said Allen Tan, director of applied technology at the foundation. Tan wants to show engineering entrepreneurs that hobby-grade printers can be used to produce durable finished products. Tan said his experience shows there's a business case for using hobby grade 3-D printers as a primary means of manufacturing a highly complex, yet low-volume production run.

Wright said 3-D printing has engineering benefits too: It enables rapid iteration and eliminates design constraints related to manufacturing processes. He noted that the same design can be used to print models at any scale. Enlarging the fuzes to twice their normal size makes inspection and teaching easier, Wright said.

The foundation launched the design lab less than two years ago, and it is now producing kits for purchase. One intention behind the model kit was to provide better training materials for programs in conflict-ravaged developing countries. But according to Tan, more than half the inquires and more than half of the sales of the training kit are to developed countries like the United States, Japan, and South Africa.

"We think it's changed the standard for training materials in our field, full stop—not just in the developing world," Tan said. **ME**

MELISSAE FELLET is a writer based in Santa Cruz, Calif.

CALL TO END CURB ON CRUDE OIL EXPORTS

THE CHAIR OF THE SENATE ENERGY AND NATURAL RESOURCES Committee, Lisa Murkowski (R-Alaska), citing a new report by the Energy Information Administration, said she favors lifting current restrictions on crude oil exports by the United States.

The EIA report, issued early in September, concluded that lifting the ban would not cause gasoline prices to rise, and could possibly help reduce them.

"This capstone report clearly points the way for Congress and the administration to act," Murkowski said. "The year of study is over. It is time to send a signal to the world by lifting the ban on oil exports from the United States."

The report is the last in a series requested in April 2014 by Murkowski and Mary Landrieu (D-La.), the Senator who chaired the energy committee at the time.

The most recent study, *Effects of Removing Restrictions on U.S. Crude Oil Exports*, concluded that allowing oil exports would increase supply and put downward pressure on prices. "Petroleum product prices in the United States, including gasoline prices, would be either unchanged or slightly reduced by the removal of current restrictions on crude oil exports," the EIA wrote.

According to the report, "Current laws and regulations allow for unlimited exports of petroleum products, but require licensing of crude oil exports. Exports of crude oil to Canada for use there are presumptively granted licenses, as are exports of crude oil from Alaska's North Slope, re-exports of foreign-sourced crude, and certain exports from California."

The restrictions date to the 1970s.

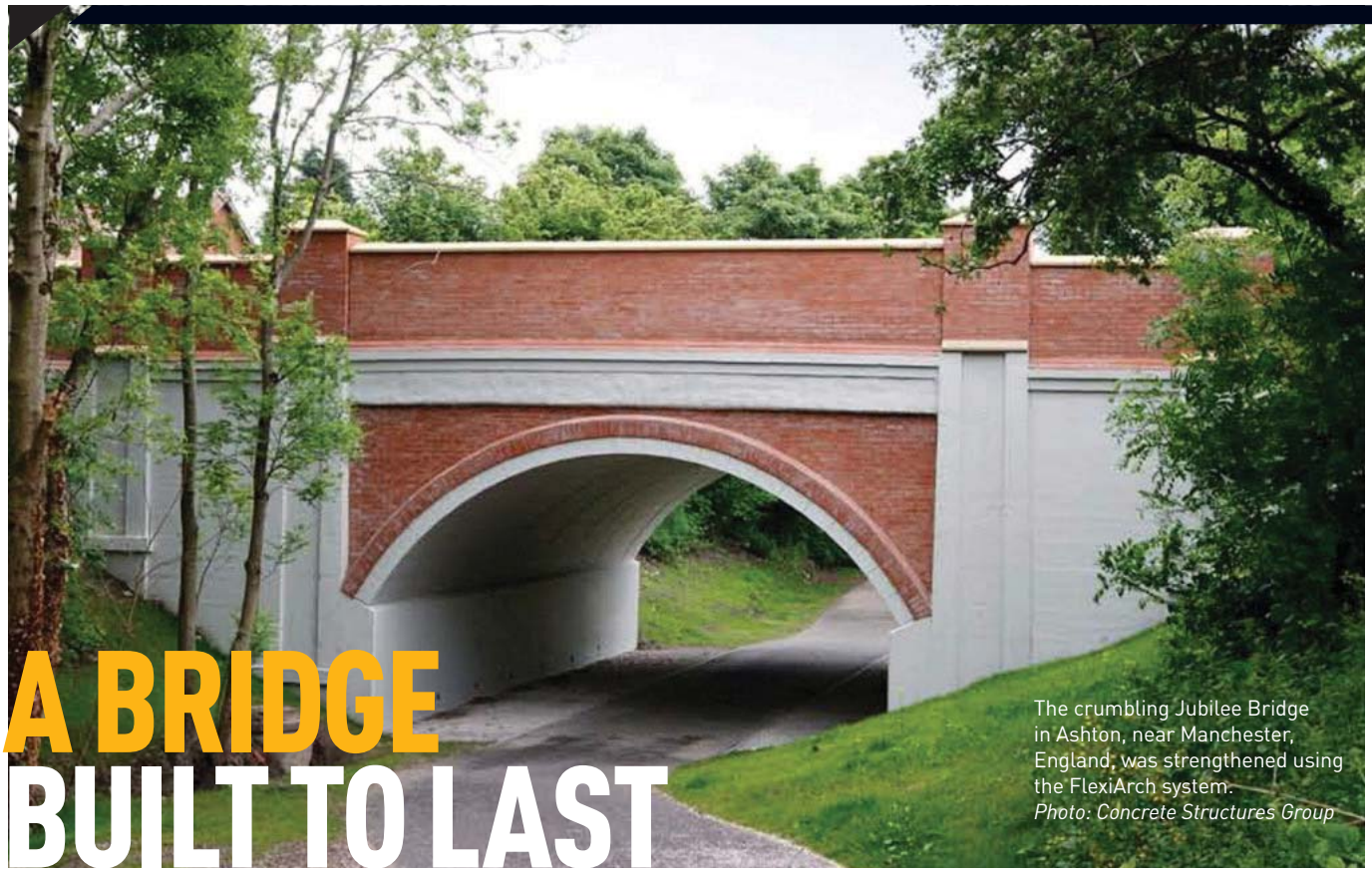
The report acknowledges that some observers refer to the restrictions as a ban on crude oil exports and adds that crude oil exports have been rising in recent years. In the first five months of 2015, the EIA said, crude oil exports averaged 491,000 barrels a day.

In addition, exports of processed condensate, not subject to the restrictions because it is considered a petroleum product, are estimated to have reached an average of 84,000 barrels a day for the same period.

Previous studies in the series by the EIA included *Technical Options for Processing Additional Light Tight Oil Volumes Within the United States*, which considered options for expanding U.S. refinery capacity, issued in April 2015; *U.S. Crude Oil Production to 2025: Updated Projection of Crude Types* in May 2015; and *What Drives U.S. Gasoline Prices?* in October 2014.

The new EIA report is available at http://tinyurl.com/EIAanalysis.

In a related development in September, the House Energy and Power Subcommittee met to markup H.R. 702, a bill to lift the restrictions on crude oil exports "to adapt to changing crude oil market conditions." An electronic copy of H.R. 702 can be found on the Energy and Commerce Committee's website at http://tinyurl.com/OilRestrictions. A background memo, amendments, and votes are available at the same link. **ME**



A BRIDGE BUILT TO LAST

The crumbling Jubilee Bridge in Ashton, near Manchester, England, was strengthened using the FlexiArch system.
Photo: Concrete Structures Group

Masonry arch bridges are some of the most beautiful bridges in the world. This type of construction goes back to antiquity, and some surviving bridges are over 2,000 years old. Although they are strong, long-lasting, and aesthetically pleasing, traditional arch bridges are expensive and time-consuming to build. As a result, most arch bridges built since the 1970s have been constructed from steel-reinforced concrete arches and slabs, which are faster and cheaper to install.

The downside, however, is that steel-reinforced concrete corrodes—so much so that a masonry arch bridge that should last several hundred years starts to crumble after 40 or 50 if it is built with steel-reinforced concrete. Because of this rapid deterioration, engineers are looking toward steel-free structures.

BECAUSE THERE IS NO CORROSION, THE BRIDGE IS EXPECTED TO LAST AT LEAST 300 YEARS WITH MINIMAL LONG-TERM MAINTENANCE

Adrian Long, a civil engineer at Queen's University in Belfast, Ireland, challenged himself to develop a modern arch bridge system with all the attributes of an unreinforced masonry arch bridge. He also set several other design goals: It had to be quick to install, and eliminate the need for centering—the use of a temporary framework to support an arch during construction. It also had to be constructed off site using precast concrete and be cost-competitive with other types of bridges.

After 10 years of research, Long perfected the FlexiArch bridge system in 2007. Because the main forces are compressive, no reinforcing steel is required. No centering is needed, and the bridge can be assembled in a day. Because there is no corrosion, the bridge is expected to last at least 300 years with minimal long-term maintenance, adding to its competitiveness with other types of bridges.

Precast voussoirs, the tapered blocks that form the arch, are laid side by side with a layer of polymeric reinforcement placed on top. This surface is then overlain with a 40 mm layer of fine aggregate concrete (screed) that hardens, assuring the voussoirs are interconnected.

"The FlexiArch units can be cast in convenient widths to suit the design requirements, site restrictions, and available lifting capacity," Long said. "When lifted at the designated anchorage points, gravity forces cause the wedge-shaped gaps to close. Concrete hinges form in the screed and the integrity of the unit is provided by tension in the polymeric reinforcement and the shear resistance of the screed."

Long said that the degree of taper of the voussoirs controls the geometry of the arch: flatter arches require less taper, for example. The arch-shaped units are then lifted and placed on precast footings at the bridge site, "with all the self-weight then transferred from tension in the polymeric reinforcement to compression in the voussoirs, acting the same way a conventional masonry arch does," Long added.

The polymeric reinforcement provides the tensile strength needed to lift the FlexiArch units safely. Lab tests that simulated the bridge-site conditions were undertaken to test the strength of the polymeric reinforcement. "Using these re-

continued on p.27 »

HOW APPROPRIATE?

THE TERM "APPROPRIATE TECHNOLOGY" is so overused as to be almost meaningless.


The universal nut sheller

In order to reclaim a meaningful understanding of appropriateness, we need to trace its historical roots, particularly the early innovators whose philosophy provides a framework for responsible intervention in today's developing communities. The modern notion of appropriate technology was not born in an engineering classroom, but out of the cauldron of a social movement led by Mahatma Gandhi whereby low-tech self-sufficiency was reclaimed to subvert and ultimately prevail over the technologically superior British Empire.

Appropriate technology, therefore, is not an end unto itself but a means to liberation. Humanitarian engineers must align design with the struggle for liberation to attain long-term impact.

Some of the earliest and most prominent literature on accountable intervention is attributed to E.F. Schumacher, a British economist whose economic theories were influenced by Gandhi. In his 1973 manifesto, *Small Is Beautiful: Economics as if People Mattered*, Schumacher explains the fundamental role of appropriate technology in sustainable development: "The task, then, is to bring into existence millions of new workplaces in the rural areas and small towns."

He proposed the idea of "intermediate technologies," which stand somewhere between the traditional and the modern. Schumacher identified four criteria for intermediate technologies, and to bring them up to date I'd like to add three more.

First, these technologies should be small, Schumacher says. According to Ian Smillie, a Schumacher scholar and historian, intermediate technology "would be small in scale so it can fit into small market situations."

Second, they must be simple. In that way, Schumacher says, "the demands for high skills are minimized, not only in the production process itself, but also in matters of organization, raw material supply, financing, and marketing, and so forth."

The rocket stove, for example, can be made from locally available mud bricks. The technology does not require complicated supply chains. It can be taken apart and put back together.

Third, they should be cheap. For example, the universal nut sheller can be locally manufactured from basic, reusable concrete molds and a metal crank. This technology is labor intensive, but it increases productivity while reducing occupational hazards such as arthritis from shelling nuts by hand.

Fourth, they must be non-violent. Schumacher insisted that products be local both in their material inputs as well as their long-term effects. According to Smillie, "An appropriate technology would be one which is completely under human control, that it would not have unintended side effects, that it would not cause social or environmental disruption."

To those original four I'd like to add a fifth: user-centered. Arguably one of Schumacher's shortcomings was his assumption that British folks could lead technology development. For local innovators and community leaders, sustainability is a matter of survival. Lasting solutions require attention to users' desires, intuition, and comfort. In order to be appropriate, technologies must be designed through participation with the user, who is the subject rather than the object of the design process.

Sixth, this technology should be pedagogical. Although many

of the communities in need of appropriate technology may lack the formal education to develop it singlehandedly, people can quickly understand, adapt, and improve upon basic concepts. In this sense, technology becomes a teaching tool to the extent that integrating it into one's lifestyle fosters an ever greater understanding of its function while nurturing an evolutionary capacity to improve upon the technology itself.

I've been part of an Engineers Without Borders USA project in an indigenous community in Guatemala where we assisted the community in replacing dysfunctional composting latrines with an anaerobic baffled reactor. Within the first year of operation, the community had made improvements to the design including a standpipe and a thatch roof. They are safely incorporating treated effluent in the school's agricultural test plot, and have asked us to assist in construction of a similar system on the other side of the river.

And finally, this technology should be liberating. An appropriate technology is one that empowers individuals to crumble the barriers of stratification within their society and overcome constraints to social and economic progress.

A version of the Rocket Stove

Based upon the philosophical roots of appropriate technology and the legacy from Gandhi to Schumacher to the present day, there are many considerations for evaluating and promoting appropriate design interventions in the field. ME

FRANK BERGH, ENGINEERINGFORCHANGE.ORG

Q&A FREEMAN HRABOWSKI

WHEN THE UNIVERSITY OF MARYLAND, Baltimore County, named Freeman Hrabowski III president 1992, it was an inner city commuter school with a shaky academic reputation. By 2009, UMBC was named the nation's top "Up and Coming" university by *U.S. News & World Report*. Born in Birmingham, Ala., and jailed at age 12 for participating in a civil rights march, Hrabowski graduated college at 19 and rose to dean of arts and sciences at Coppin State University by 27. He has been honored by organizations as diverse as *Time*, Harvard, and the Carnegie Corp.

ME: How did the University of Maryland, Baltimore County, become a powerhouse for minority achievement in STEM?

F.H: We started by using analytics to look at broad trends. They showed that we needed to understand more about our students' academic preparation, the courses they were taking, and their attitudes.

We found, for example, that many engineering students expected to study for a couple of hours at night, while working 15 or 20 hours on a job. To succeed, you have to marry engineering—you can't be a part-time friend. You need to study and find lab time five or six hours every day, because if you don't do well in the foundation courses, you are not going to succeed in STEM.

ME: What else does it take to succeed in STEM?

F.H: It doesn't surprise people that only 20 percent of African-American and Hispanic students who begin STEM courses graduate in STEM majors. But people are stunned that only 32 percent of whites and only 41 percent of Asians graduate in STEM.

This is often because they don't do well in first-year courses, which many schools consider weed-out courses. One reason is that students don't get support from mentors or other students. Also, many schools have not moved to an innovative approach to the teaching and learning process.

ME: How did you change that?

F.H: We teamed with Bob Meyerhoff, a local philanthropist who studied engineering at MIT and wanted to do something for African-American males. The university wanted to improve the performance of minority students in STEM. So we married the two ideas. We started with 19 scholarships to bring highly motivated students to UMBC. Today, we have 300 Meyerhof scholars at UMBC, including women and people of all races. They form a highly motivated core.

The program also focused on building community among all our students and faculty. We redesigned our courses to reduce lectures and increase lab work and collaboration, so students can support one another. As a result, 55 percent of students who major in STEM graduate in STEM majors, and when you take into account students who transfer to other schools but stay in STEM, that goes up to 75 percent.

ME: Do you demand a lot from students?

F.H: Yes. We want students to think about going immediately to graduate school. Thousands of our students are involved in research opportunities on campus, in companies, at medical centers, and such national agencies as NASA and NIST. UMBC is a great American story: you don't have to be rich to be brilliant or to be the very best.

ME: UMBC has become a diverse, high-performing campus. Can any school replicate your leadership?

F.H: Leadership is never about one person. It's not like, I've got a plan, follow my plan. A president serves by working with a community of people with similar values who tackle problems together. The leader is important, but the community's chemistry makes or breaks the school.

ME: Looking back, it looks like you couldn't miss. Was your path that easy or obvious?

F.H: I worked really hard, so hard that my parents always worried that I was overreaching. I am passionate about what I do, and I was fortunate to be around people who valued hard work, intellectual curiosity, focus, and discipline. I never gave up. **ME**

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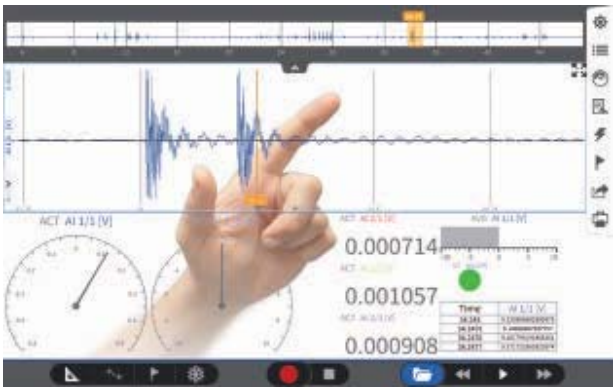

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DISRUPTIVE DRONES

UAVs can be useful humanitarian tools, as long as they don't create **more problems than they solve**.

Last August, I spent a lazy Sunday morning in a village an hour outside of Kigali, Rwanda, with a 3DR Solo quadcopter. My objective was to take videos of tree stands where residents collect wood, so we could study forestry changes in a village that has received high-efficiency cookstoves. I had intended to get sample images to build a case with the authorities for a broader study.

A task as seemingly simple as counting trees is in reality time-consuming and costly for many organizations. In Rwanda, we count trees that are being used for fuel. Conservation groups like the Freshwater Trust, in Portland, Ore., have teams of specialists to count trees year round in conservation project areas.

These surveys are crucial to environmental efforts. They also could use drones to save time and money. Drones combined with high-resolution photography, laser-radar sensors, spectrometry, and image processing software can take a biomass inventory cheaper and faster, and maybe more accurately, than people can by trudging around counting.

It was a fun morning in Rwanda. A crowd of kids mugged for the airborne camera. But their playful gestures ordering the drone to land may have been a clue that trouble was coming.

I figured my weekend activities wouldn't ruffle any feathers in a remote village. I was wrong.

The next day one of our senior staff was summoned into the office of the Rwandan Air Force to explain why some random American was flying a drone.

That night, I spent two hours at the airport explaining myself to five police officers, only getting out of there after giving two ad-hoc presentations of my TEDx Talk.

In the United States, it's currently legal to fly unmanned aerial vehicles as a hobby— below 400 feet, away from people and structures, and outside of restricted airspace like airports or military sites. It requires a special FAA permit to fly a drone for any commercial or research purpose. This includes everything from wedding photography to university research.

IT REQUIRES A SPECIAL FAA PERMIT TO FLY A DRONE FOR ANY COMMERCIAL OR RESEARCH PURPOSE. THIS INCLUDES EVERYTHING FROM WEDDING PHOTOGRAPHY TO UNIVERSITY RESEARCH.

In Nepal during the earthquake relief efforts this summer, numerous articles reported how drones were helping the relief effort—identifying survivors and resources. What didn't get as much press were the privacy, security, and safety issues, and general interference with relief efforts that some drone operators caused.

Recently, colleagues at Emory University have asked us to develop a methodology for assessing open defecation practices in rural India—essentially an image-processing algorithm to detect human poop in a field. We've put this on the back burner after realizing there'd be little way to ensure that we don't intrude on someone's privacy.

UAViators (www.uaviators.org), a consortium of humanitarian organizations, is trying to tame this wilderness. The group supports international guidelines for the responsible use of UAVs.

For a hobbyist or researcher in the United States, there are practical tools to keep you out of trouble, including the Don't Fly Drones Here map (www.mapbox.com/drone/no-fly).

Drones have the potential to be disruptive—in the tech sense as a low-cost, capable alternative to something expensive, but also legally and socially, intruding on privacy, serenity, and safety.

Consider, for example, the "Follow Me" mode on the 3DR Solo, where the drone stays alongside you (or, really, your phone) as you walk, run, or even drive. It is exhilarating but also eerie, sparking possibilities and some fear. ME

EVAN THOMAS is an assistant professor of mechanical engineering at Portland State University, COO of DelAgua Health, and CEO of SweetSense Inc.

The Y-shape silicone guideway for regrowing a rat's sciatic nerve was fabricated using a 3-D printer.
Photo: University of Minnesota.

GUIDEWAY FOR NERVE GROWTH

Surgeons can reattach severed body parts, but restoring full function is difficult. One of the main problems is that damage to severed nerves is nearly impossible to overcome.

Recently, however, a team of medical researchers developed a method to regrow nerves to restore both sensory and motor functions of complex nerves after injury. The researchers employed a guideway fabricated through 3-D printing to create a path for the nerves to follow.

Researchers from the University of Minnesota, Johns Hopkins University, and other universities used a 3-D scanner to reverse engineer the structure of a rat's sciatic nerve. They then used a custom-built 3-D printer to build a guide for regeneration using inert silicone that was impregnated with chemical cues to promote both motor and sensory nerve regeneration.

Scanning and printing takes about an hour, but the body needs several weeks to regrow the nerves. Bioengineers implanted the guide into the rat by surgically grafting it to the cut ends of the nerve, and it took about 10 to 12 weeks for the rat's ability to walk to improve.

The research was published in September in the journal *Advanced Functional Materials*.

A mechanical engineering professor at the University of Minnesota, Michael McAlpine, said in a press release that previous studies had shown regrowth of linear nerves, but this experiment was the first time that a custom guide had promoted the regeneration of a complex nerve like the Y-shaped sciatic nerve that has both sensory and motor branches.

The research team hoped to move on to implanting these sorts of guides into humans in subsequent research. ME

Kai Vetter, right, and scientific engineering associate Andy Haefner, who is holding a multi-mode Imager. They are looking at a 3-D model of a gamma-ray source.
Photo: Roy Kaltschmidt, Berkeley Lab

RADIATION INSIGHTS

ADVANCES IN NUCLEAR engineering continue to have big impacts on society, including national security, power generation, aerospace, medical imaging, medical therapies, and environmental protection. This month we visit two nuclear engineering labs that are working on innovative technologies to make the world a safer and healthier place.

Established in 2011, the Applied Nuclear Physics Program at Lawrence Berkeley aims to advance nuclear science in ways that will have key positive impacts on society. Research interests include applied nuclear physics, neutrino physics, astrophysics, biomedical imaging, cancer diagnostics and therapies, and nuclear safety and decontamination.

RADIOLOGICAL RESILIENCE

THE LAB Applied Nuclear Physics Program, Lawrence Berkeley National Laboratory; Kai Vetter, director.

OBJECTIVE To develop new concepts and technologies that address challenges in basic and applied nuclear research and also benefit national security, society, and human health.

DEVELOPMENT Systems to monitor radiation contamination and communicate findings.

Using the "live" example of Fukushima, director Kai Vetter's nuclear safety research includes mapping radiation contamination in evacuated areas. He has also collaborated with other researchers to launch several websites aimed at helping the public better understand the risks of contamination. These include Radwatch, a near real-time posting of radiation test results from a variety of sample types, including soil and milk, and Kelpwatch, which shows the extent of possible radionuclide contamination (primarily Cesium-137 and -134) in the kelp forest ecosystem along the Pacific coast, arriving with seawater from Fukushima in 2014.

"Our ultimate goal," Vetter said, "is to create large-scale, multi-sensor, multi-platform radiation detection systems that help us become—at least radiologically—a more resilient society."

Toward this end Vetter established the Institute for Resilient Communities at Lawrence Berkeley and the University of California, Berkeley in 2015. Its mission is to provide tools to

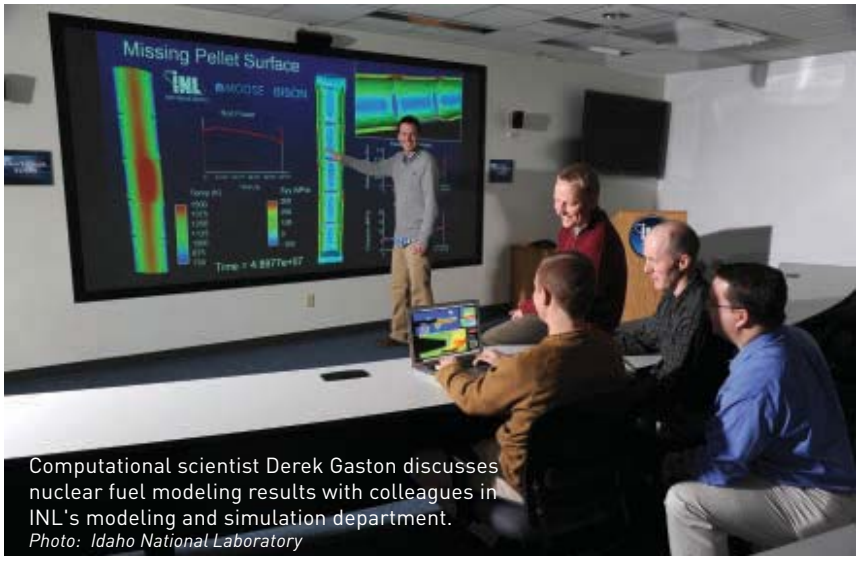
enhance resilience in communities and minimize the local and global impact associated with sudden or long-term radiation changes induced by human actions or nature.

Researchers will study contamination mapping in complex environments, contamination transport in complex environments, health effects, and mitigation strategies, including removal of cesium from soil.

"We are initially focusing on radiological resilience by integrating scientists, engineers, educators, schools, and communities in Berkeley and Japan," Vetter said. "But we also envision to expand from local to global communities as the impact of radiological events, although local at first, will have a global impact and go beyond radiological resilience to include energy, health, climate." ME

Idaho National Laboratory is the lead nuclear energy lab for the U.S. Department of Energy. Test facilities include a utility-scale power-grid loop, comprehensive cellular network, nuclear materials testing and analysis facilities, bulk-explosives test bed, and unmanned aerial vehicle runway. Research is focused on sustaining light water reactors, fuel cycle research and development, generation-IV nuclear power, nuclear hydrogen, radioisotope power systems, and isotope technologies.

An overarching thrust of INL research is energy security, which includes resource security, economic stability, and long-term environmental sustainability. Scientists and engineers are exploring solutions to critical global issues such as clean energy development, water resource management, and carbon life-cycle options.



Computational scientist Derek Gaston discusses nuclear fuel modeling results with colleagues in INL's modeling and simulation department.
Photo: Idaho National Laboratory

Solving these issues is made easier by INL's Multiphysics Object-Oriented Simulation Environment, or MOOSE—a computer simulation framework that simplifies predicting the behavior of complex systems, ranging from irradiation effects on materials to groundwater physics and chemistry.

MOOSE was developed by utilizing computer code and numerical libraries from a number of "massively scaling numerical tools" developed by the Department of Energy and university researchers. One of the greatest benefits of MOOSE is that simulation tools can be developed in a fraction of the time previously required.

"People who were doing these simulations before had to develop the entire code," said Derek Gaston, a computational scientist with INL's Computational Frameworks Group. "Something that would take five years with a team of 10 people can now be done in one year with three people."

Another advantage is that researchers no longer have to be computer science experts (for example, with proficiency in parallel code development) to develop their simulations. MOOSE is essentially a "plug-and-play" system—scientists enter their mathematical data and MOOSE conducts the simulation. Yet another benefit of MOOSE is that it can be accessed at personal workstations.

MOOSE has revolutionized predictive modeling, especially in nuclear engineering. For example, MOOSE can simultaneously run models for nuclear fuel components at both a microstructure scale and engineering scale, creating a simulation that shows how radiation effects at the microscopic level evolve into fuel or cladding failures at the macroscopic level. The result is "an extremely high fidelity simulation of nuclear fuel rod behavior," Gaston said. ME

MARK CRAWFORD

CLEARER—AND FASTER—PREDICTIONS

THE LAB Computational Frameworks Group, Idaho National Laboratory, Idaho Falls; Derek Gaston, computational scientist.

OBJECTIVE Energy and national security infrastructure protection, water resource management, clean energy development, and environmental protection.

DEVELOPMENT Computer modeling codes that help evaluate and predict the behavior of systems that make up nuclear power systems.

MAJORS TO EXPLORE THE RUSSIAN SHELF

The Russian Federal Agency for Subsoil Use, or Rosnedra, is considering 11 applications from Rosneft and Gazprom for licenses to develop oil and gas fields on Russia's continental shelf, according to a report by Tass, the state-owned news agency.

The Minister of Natural Resources and Environment, Sergey Donskoi, said both companies, which are controlled by the Russian government, had placed the applications.

Oil rig operating in Russian waters. *Photo: TASS*

Rosneft, formed in 1993 as a government-owned corporation, is descended from the Soviet Ministry of Oil and Gas. It became Russia's leading oil company after it purchased the assets of Yukos in state-run auctions. The company made an initial public offering of stock in 2006.

Gazprom, the largest producer of natural gas in the world, by its own estimates produces about 12 percent of the world's gas. The company was formed in 1989 when the Soviet Ministry of Oil and Gas became a private corporation. Gazprom was later partly privatized. The Russian government retains majority interest in the company.

According to Tass, the Energy Ministry predicts that Russia's production of shelf oil will increase from the current 17 million metric tons to 20 million by 2020, and eventually increase to almost 10 percent of Russia's total production, or 50 million tons out of a total 525 million.

The Energy Ministry expects the annual production on the Arctic shelf to amount to 3 million tons in 2020, and to increase to 33 million by 2035. ME

CHINA CAR SALES TAP THE BRAKES

The Chinese automobile market has experienced robust growth for many years, but the country's economic struggles are now being seen in car sales. According to an analysis by consulting firm PwC, automobile sales declined over the summer, with preliminary sales in July falling 6.6 percent short of the sales for the same month in 2014.

According to the analysis, published in the company's *Autofacts*, the rapid year-over-year growth in car sales in the Chinese market had not been expected to continue indefinitely. Factories in China produced 15.7 million vehicles in 2010; by 2014, that had jumped to 22.1 million vehicles.

But the slowdown in sales took automakers and analysts by surprise in its speed and timing. In the first four months of 2015, for instance, 6.9 million vehicles had been sold in China, compared to just 6 million for the same period in 2014.

While overall sales declined in the summer months, the problems were limited to certain types of vehicles. Passenger cars and minivans were the most affected; minivan sales dropped by around 40 percent. Meanwhile, sport utility vehicle sales improved by more than 50 percent.

The analysts at PwC are still bullish on the Chinese auto market. In spite of temporary slumps, they forecast vehicle sales to increase at a rate better than 4 percent over the next several years, with sales totaling 31.5 million vehicles by 2021.

"There is little doubt that the current backdrop in China is cause for concern," the analysis states, "but the long-term potential remains, even amidst tempered economic growth overall." **ME**

"IT JUST TAKES TOO LONG and companies run out of time and money, and they just go elsewhere. African governments must cut down on bureaucracy, which historically is a very hard thing to do in parts of Africa."

— Stephen Hayes, President of the Corporate Council on Africa
Reported in the Business and Financial Times,
Accra, Ghana, Aug. 7, 2015

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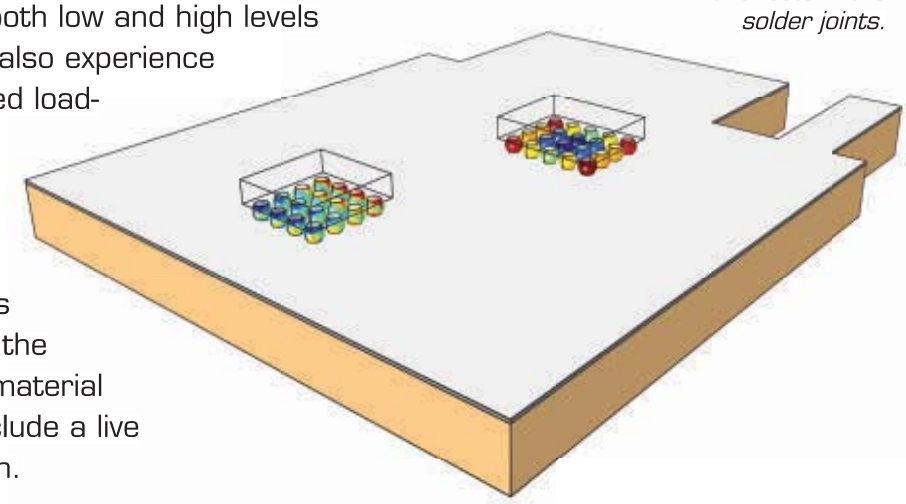

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MECHANICAL ENGINEERING

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KENYA SIGNS CHINA TO EXTEND RAILWAY

The railroad link to Lake Naivasha is expected to create new economic opportunities.

Kenyan Railways Corp. has signed an agreement with China Road and Bridge Corp. to extend the Mombasa-Nairobi standard gauge railway line to Naivasha, about 120 kilometers northwest of the capital.

The extension of the railway is expected to increase economic opportunities, especially farming, at Naivasha.

Naivasha is in the Rift Valley, in a region with a high concentration of geothermal activity, some of which is being diverted to generate electricity. According to the website of one power provider, Geothermal Development Co., "More than 14 high temperature potential sites occur along the Kenyan Rift Valley with an estimated potential of more than 15,000 MWe."

The Export-Import Bank of China is financing 90 percent of the first leg of the railroad, which connects Kenya's capital and its principal port. Kenya's government is covering the other 10 percent.

The railroad is a Vision 2030 flagship project in Kenya. It is designed to reduce transportation costs and time, and so bring down the cost of commodities and of doing business.

The first part of the railway project is expected to cut the time passengers take to travel from Mombasa to Nairobi from the current eight hours to about four and a half. Freight trains will reduce the time it takes to move cargo between the two cities to eight hours.

The Mombasa-Nairobi line will be 472 km long and is expected to cost the equivalent of $3.8 billion. It has been called Kenya's largest infrastructure project since the country gained its independence.

China Road and Bridge Corp., the Chinese contractor, has hired more than 25,000 local workers and trained over 16,000 Kenyan engineers and technicians since the start of the construction earlier this year.

According to a Kenyan magazine, *Construction Business Review*, a source said the extension to Naivasha will cost about $1.5 billion. The magazine said construction costs will be higher than those of the Mombasa-Nairobi line because the terrain of the Rift Valley will require more tunnels and bridges. The Mombasa-Nairobi line will include about 30 km of bridges, including a 2 km bridge over the Tsavo River, crossings with the current meter-gauge line, and eight corridors to let elephants pass under the track.

The magazine also has reported that the project has already suffered the effects of a culture clash. According to the *Review*, supervising consultants disagreed in March with China Road and Bridge Corp. engineers on the design of culverts. China Road and Bridge was following a Chinese design standard, which differed from the British standard familiar to Kenyan engineers.

The disagreement halted work until both sides agreed in April to adhere to set requirements. ME

continued from page 12 »

A BRIDGE BUILT TO LAST

sults and taking into account creep effects, an appropriate load factor was applied to ensure there was no risk of failure during lifting," Long said. "A typical unit can be accurately located on-site every 15 minutes, therefore, most bridges can be installed in well under a day."

A number of static loading tests were also carried out to validate the performance of the system. These have included model tests in the laboratory (at fifth, quarter, and third scale) with granular or concrete backfill where it was possible to achieve the ultimate capacity.

Full-scale tests under maximum loads (equivalent wheel load of 320 kN, or lane loading of over 1,000 kN) also showed the bridge system more than satisfied the stringent requirements for highway bridges. Span lengths can reach 30 meters.

To date, more than 50 of these bridges have been built in the U.K. and Ireland, and discussions are in progress with several U.S. companies.

"By interconnecting the accurately precast voussoirs via a screed and polymeric reinforcement, arches can be produced to the precision required by designers without the need for centering," Long said. "The speed of installation is comparable with precast concrete/steel beams. As such, it can be used for road bridges over railway lines where construction windows are restrictive. As there is no corrodible reinforcement, total life cycle costs are therefore minimal." **ME**

FlexiArch elements being lowered into place.
Photo: Concrete Structures Group

MARK CRAWFORD, ASME.ORG

DANGERS AHEAD ... FOR THE ENGINEERING PROFESSION

LOOKING BACK

Could engineering become a commodity? An ASME Fellow thought so when this article was published in November 1955.

BY N.T. VEATCH, BLACK & VEATCH, ASME FELLOW

A member of the ASME Committee on Professional Practice of Consulting Engineering, recommended that engineering consultants avoid competitive bidding for professional services.

Competitive bidding is believed to present one of the gravest dangers to the engineering profession. Its universal adoption on the part of the engineer and the client would end any justification for engineering being considered a profession.

Competitive bidding is well established as a proper and many times a desirable practice in commercial-business transactions. It has not been a serious problem in any other learned professions due to discipline within their own ranks. It has become a real problem in engineering perhaps because the engineer is usually directly concerned with projects involving competitive bidding and the expenditure of large sums of money.

Engineering is the most essential component of every item of construction or manufacture, be it a sidewalk or a battleship, and since competitive bidding is adaptable to most of the other components, it requires some careful thinking to realize that the temptation to include engineering service in a bid is actually not to the best interests of the owner or client.

It is believed that competitive bidding may be properly used for anything that may be adequately specified, but no one can adequately specify the workings of a man's brain. That is exactly what is involved in engineering service. If there is any single lesson to be learned from centuries of professional experience, it is that brain power cannot be and should not be standardized.

There are many circumstances presented to the practicing engineer in the requests received for information regarding his services. The requests range from a statement that bids, sometimes designated sealed bids, will be received at a certain date and time, and then publicly opened, to one which states the engineer has been selected to perform certain services and asks for a formal proposal. At times there is even a formal advertisement for bids. Requests for competitive bids on a price basis, whether by letter or through formal advertisement, or the submission of a proposal in response to them would clearly be an infringement of the codes of the leading engineering societies. ...

It must be recognized that there will constantly be new faces appearing in the consulting field, and such individuals or firms must get a start, and that only time and experience can make their services comparable to those of older ones. Naturally, these younger consultants will and can furnish services for lower fees than those having more expensive operations. These newer firms or individuals have a very proper place in the profession, as they will someday be the leaders, and there are many projects upon which their services are entirely satisfactory. However, the clients' interests will always be best served if selection of engineering talent be governed primarily by qualifications needed for the particular project and with the fee being entirely secondary. ME

ENTER THE COUCH POTATO

Nikola Tesla demonstrated a radio-controlled boat in New York in 1898. But it was not until 1955 that wireless remote became really serious. That year, Zenith Radio Corp. introduced Flash-Matic, the first wireless remote control for television. It was developed by Eugene Polley and sent signals of visible light.

Photo: Zenith Electronics, LLC

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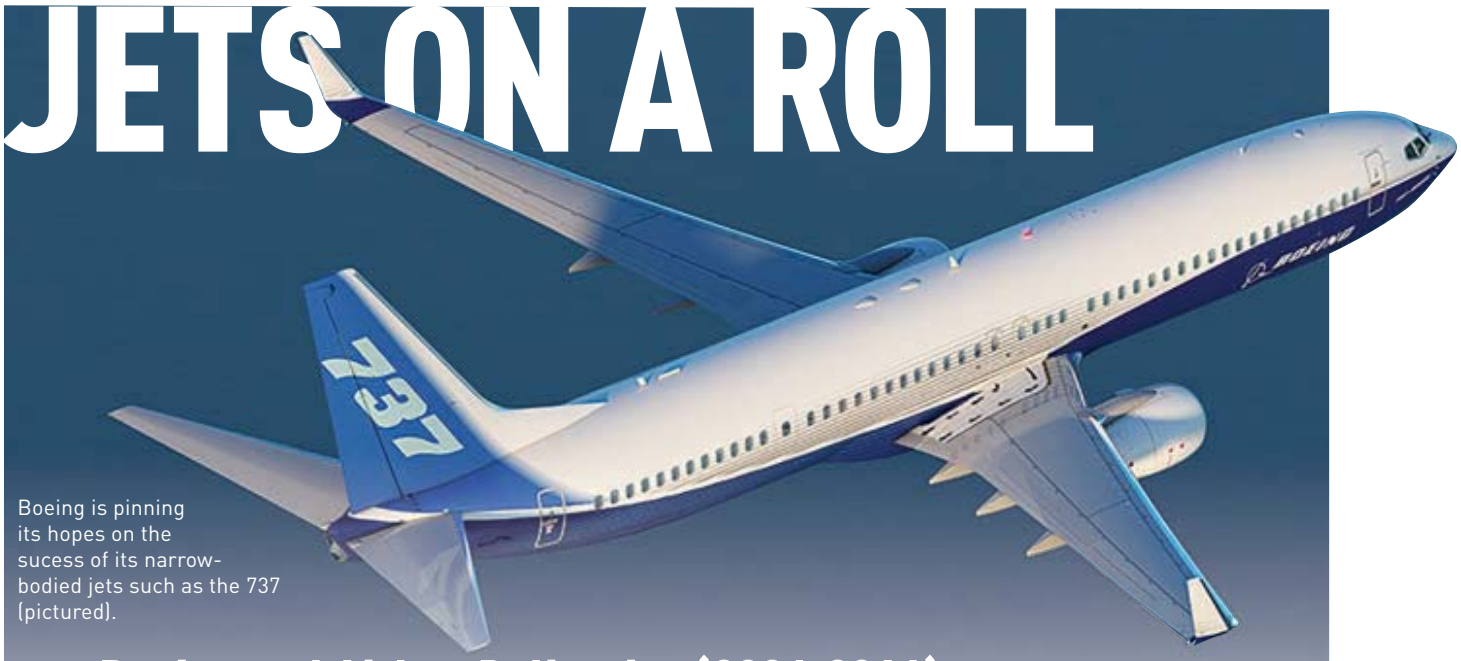
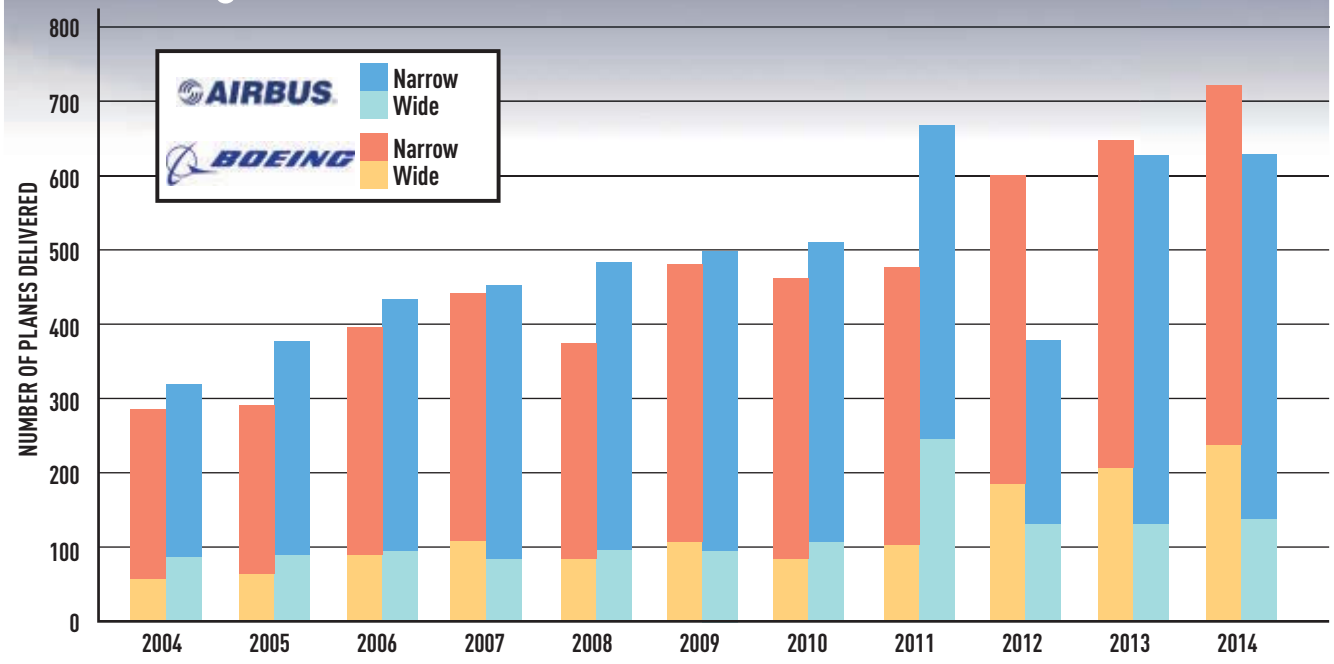
BY THE NUMBERS: JETS ON A ROLL



Boeing is pinning its hopes on the sucess of its narrow-bodied jets such as the 737 (pictured).

Boeing and Airbus Deliveries (2004-2014)



Source: Airbus Group NV, Boeing Co.

Wide-body jets such as the Airbus A380 (left) have accounted for half of the airline industry purchasing dollars.

The two commercial aircraft leaders see almost eye to eye on the future, but differ on the details.

Both companies, Boeing and Airbus, expect economic growth to double the number of passenger and cargo jets over the next 20 years. Boeing predicts global sales of jet aircraft will rise an average of 4.9 percent per year. Airbus, forecasting an average increase of 4.6 percent per year, is only a shade more conservative. Their numbers would yield a market worth $4.9 trillion to $5.6 trillion between 2014 and 2034.

"If the past is any guide, these estimates are very reasonable," said Richard L. Aboulafia, vice president of analysis at Teal Group, an aerospace and defense analysis firm.

Although their totals nearly match, Boeing and Airbus differ on the market's makeup. Boeing believes that passengers and shippers who want point-to-point convenience will drive demand for single-aisle airliners and cargo jets.

Airbus disagrees. It expects increasing traffic between megacities will drive demand for more dual-aisle wide-body aircraft.

So while the two companies predict $2.7 trillion in wide-body sales over the coming 20 years, they paint very different futures. Boeing sees 8,830 wide-body aircraft, equivalent to 25 percent of total deliveries and 49 percent of total sales; Airbus expects 9,658 of those planes, equal to 30 percent of a smaller total market and 55 percent of sales.

Their single-aisle airplane projections also diverge sharply. Airbus predicts 22,927 single-aisle aircraft worth $2.2 trillion over the next two decades. Boeing, which sees a $600 billion larger total market, expects 26,730 single-aisle airplanes worth $2.8 trillion.

So far, history seems to support Boeing. The Airbus A380, a double-deck superjumbo, entered commercial service in October 2007, has gained little traction among global carriers, while sales of the new single-aisle Airbus A320neo are growing rapidly.

Still, wide-body aircraft have historically accounted for half of airplane sales dollars, and that will be true going forward, Aboulafia said.

Aircraft makers agree that emerging nations will be major growth drivers. Airbus expects traffic in China to triple between 2014 and 2034. Brazilian aerospace conglomerate Embraer predicts China and the Middle East will be the fastest growing markets, followed by Latin America, Africa, Asia Pacific, and the Commonwealth of Independent States.

Boeing predicts that increasing air traffic in the Asia-Pacific region will lead to purchases of more than 14,000 new airplanes valued at $2.2 trillion.

Boeing and Airbus are also bullish on air cargo. Boeing estimates 4.7 percent annual growth will expand the freighter fleet by 70 percent, to 2,930 jets, by 2034. Airbus predicts a 65 percent increase.

These optimistic forecasts may face head winds, such as the recent economic slowdown in China. A 2015 report by the International Air Transport Association, which represents the airline industry, acknowledges that air passenger markets will be hit by shocks, but predicts that they will rebound, as they have done in the past.

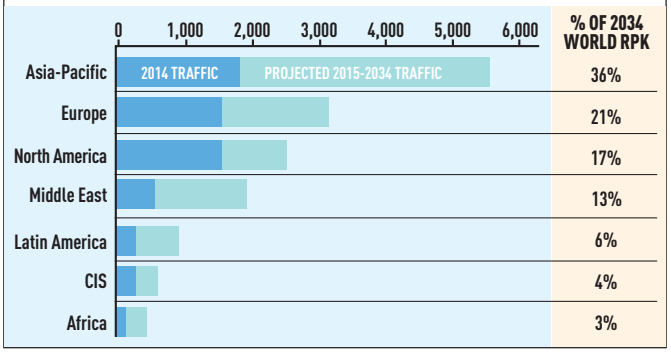
Aboulafia agrees. For 60 years, he said, remarkably consistent jetliner markets have made long-term forecasts relatively easy.

"It is predicting the next year that is impossible. The ups and down are beyond most predictive powers," he said. ME

WORLD PASSENGER TRAFFIC BY 2034

Billions of passenger kilometers, by airline domicile

Last year Asia Pacific narrowly edged out Europe and North America in RPK (revenue passenger kilometers: each kilometer flown by a paying passenger). This will change in the coming 20 years, as Asia Pacific dramatically outpaces the rest of the world in the volume of passenger traffic.



Source: Airbus GMF2015

COMMERCIAL PLANE DELIVERIES: 20 YEAR PROJECTIONS*

	WIDE BODY	NARROW BODY
BOEING	8,600	25,680
AIRBUS	9,658	22,927

*Boeing: 2014-2033; Aribus: 2015-2034

GREG FREIHERR is a freelance writer in Fond du Lac, Wis., who specializes in aerospace and medical technology.

DELIVERING THE GOODS

Effective supply chains are essential for success in developing markets, and they can be challenging to develop.

By Mark Crawford

COMPANIES THAT PROVIDE PRODUCTS TO DEVELOPING NATIONS—ESPECIALLY THOSE IN SUB-SAHARAN AFRICA, CENTRAL AMERICA, AND ASIA—OFTEN FACE SIGNIFICANT SUPPLY CHAIN CHALLENGES. THEY HAVE TO DEAL WITH A LACK OF SKILLED LABOR, COMPLEX TARIFF SCHEMES, AND INADEQUATE ACCESS TO BASE MATERIALS AND MANUFACTURING EQUIPMENT.

Supply chains in developing markets are often longer and more complex than those in the developed world's markets. Depending on the end product and customer—for example, high-income customer versus base-of-the-pyramid customer—base material sourcing, manufacturing, and assembly are likely happening in different places.

One of the greatest challenges to supply chains is government policy, which tends to have greater influence in emerging markets than in most developed ones. Local, regional, and national laws, regulations, and taxes can often make the difference between profit and loss. Governments of some developing countries, anxious to raise their standards of living and create local jobs, pass laws and create tax structures that favor in-country production. Brazil's complex tax regime, for example, strongly favors local production.

Getting all the required permits and approvals can also be difficult and time-consuming. In many emerging markets, companies must obtain official authorization to perform basic supply chain functions such as warehousing and distribution, or operating a retail outlet. In India, for example, foreign retailers were not allowed to open their own outlets until 2011.

Shipping containers wait at the terminal at Port Elizabeth, N.J.

STRATEGIC VALUE

The technology of transportation, communication, shipping, and delivery is, of course, far more advanced and integrated in industrialized nations than in developing countries. This especially affects supply chain management, or SCM. Developing nations, for instance, are typically less sophisticated in areas of software, so tracking the status of products moving through the supply chain is difficult or impossible. Communications—for example, electronic data exchanges between trucking companies and shippers—are also problematical. Third-party logistics services, which are critical for efficiently managing supply chains in the West, are often poorly developed in emerging nations.

"In many developing countries, SCM is still regarded as a low-value, tactical discipline, which means that its strategic value is often not fully exploited," said Ken Cottrill, research marketing and development lead for the Massachusetts Institute of Technology's Center for Transportation and Logistics. Part of MIT's School of Engineering, the center coordinates more than 100 supply chain research efforts across the MIT campus and around the world.

The center also addresses the lack of supply chain management skills by creating centers of education and research in developing countries. For example, the Malaysia Institute for Supply Chain Innovation, or MISI, is a joint venture

> "WORKING OUT THE BEST WAY TO SOURCE PRODUCTS AND FIND GOOD LOGISTICS PARTNERS FOR THESE PRODUCTS HAS BEEN A BIG CHALLENGE."
>
> — JACKIE STENSON, MECHANICAL ENGINEER AND CO-FOUNDER OF ESSMART GLOBAL

Essmart local sales team at product demonstration in local village.

between MIT and the Government of Malaysia. Launched in 2011 in Shah Alam, Malaysia, MISI is part of the MIT Global SCALE (Supply Chain and Logistics Excellence) Network. This international alliance of leading research and educational organizations is focused developing innovative global supply chain and logistics solutions.

Modeled after MIT's supply chain management program at the Center for Transportation and Logistics, MISI, an independent academic institution established under Malaysian law, offers both master and doctoral programs in supply chain management and logistics. "MISI's program is now educating talented supply chain master's students from across Asia," Cottrill said. "MISI will also conduct research and corporate outreach activities for global as well as local firms that operate in Southeast Asia."

SUPPLY CHAINS IN ACTION

Essmart Global, based in Cambridge, Mass., provides essential technology manufacturers with a marketing and distribution channel in Tamil Nadu, India. The company provides lighting, cooking, clean water, farming, and electronics products to low- and middle-income households, especially in hard-to-reach areas.

Products are selected by a team experienced in engineering, user design, and cultural considerations. All Essmart Global providers have a local presence in India, either by importing their products or manufacturing in-country. Essmart Global helps distribute these products to customers in areas outside cities.

"Working out the best way to source products and find good logistics partners for these products has been a big challenge," said Jackie Stenson, a mechanical engineer and co-founder of Essmart Global. "There are no logistics companies that can provide delivery to the 'last mile' beyond tier-3 cities. This is where our local sales executives take over. They drive on routes to our rural retail shops and deliver our products via motorbike." Tier-3 cities are those with populations under 1 million.

This is similar to an approach that Coca-Cola developed for getting its products to rural end-users in East Africa. To deliver its products to thousands of rural outlets, Coca-Cola established a network of "micro-distribution centers" in these areas. MDC owners use handcarts to complete last-mile delivery.

"Since launching the concept in Ethiopia in 1999, Coca-Cola has developed a network of more than 3,000 MDCs across East Africa," wrote Ashish Avasthy, an analyst for McKinsey & Co., in a January 2015 article, "Winning Supply Chain Strategies for African Markets," in *Supply Chain Quarterly*. "Further, Coca-Cola says that its MDC network handles the distribution of more than 80 percent of its business in some East African countries, providing employment for 13,500 people."

Joe Fernandez is founder and executive director of Houston-based Trade Without Borders, an organization that provides energy products, especially solar systems and devices powered by solar,

and low-power dc appliances to developing regions in Asia, Africa, and Latin America. All of its products are manufactured in China.

"The scale of manufacturing operations can be large in China, as there are fewer restrictions to scaling up one's manufacturing operations," Fernandez said. "The manufacturing ecosystem also makes access to components much easier. In certain sectors, manufacturing clusters exist so many major components can be more easily secured from vendors in closer proximity to the final product manufacturer."

To date Trade Without Borders has shipped over 60,000 products and is now focused on building a global franchise network, composed of local companies in the clean energy business. Franchisees use TWB's online platform—with web and mobile applications—to support their businesses. Franchisees have access to TWB's full portfolio of clean energy products and supporting global trading services, and in the future, will have access to education, training resources, and financing.

"The franchisees have their responsibilities also, including providing feedback on local market needs, providing after-sales service and support for locally distributed products, and coordinating impact assessment work to understand the social, economic, and environmental impact of our products on local communities," Fernandez said. "The impact assessment is important to us as a social enterprise."

Based in Vashon, Wash., BURN Manufacturing Co. designs and manufactures high-quality, clean-burning cook stoves for the developing world. The cook stoves are manufactured in Kenya. Eighty percent of the raw materials are sourced offshore (mostly from China) and 20 percent are locally derived. The immensely popular "jikokoa" stove is sold mostly in Kenya with some additional sales in Tanzania, Uganda, South Sudan, Democratic Republic of the Congo, and Zambia.

BURN Manufacturing's CEO, Peter Scott, is a champion of local sourcing and manufacturing, when possible. "Ensuring quality at the source is expensive and time-consuming when you have multiple suppliers across the world, or even across a single country such as China," Scott said. "We prefer to purchase in-country. If quality issues arise, they are easier to address with local suppliers. Our supply chain works very closely with our designers and engineers to ensure that we are

"IN CERTAIN SECTORS, MANUFACTURING CLUSTERS EXIST SO MANY MAJOR COMPONENTS CAN BE MORE EASILY SECURED FROM VENDORS IN CLOSER PROXIMITY TO THE FINAL PRODUCT MANUFACTURER."

— JOE FERNANDEZ, FOUNDER AND EXECUTIVE DIRECTOR, TRADE WITHOUT BORDERS

"OUR SUPPLY CHAIN WORKS VERY CLOSELY WITH OUR DESIGNERS AND ENGINEERS TO ENSURE THAT WE ARE USING MATERIALS THAT CAN BE PRACTICALLY SOURCED. THIS MUST BE DONE RIGHT AT THE BEGINNING OF THE DESIGN PROCESS TO ACHIEVE THE BEST COST EFFICIENCY."

— PETER SCOTT, CEO, BURN MANUFACTURING

BURN's charcoal cook stove is assembled locally in Kenya.

using materials that can be practically sourced. This must be done right at the beginning of the design process to achieve the best cost efficiency."

Many people, Scott pointed out, believe that local modern manufacturing is not possible in East Africa.

"This is not true," he said. "If you have a solid product, go out and raise sufficient capital so you can manufacture locally. Do not subcontract. Develop a strong relationship with a logistics company. Also develop multiple distribution channels to minimize the risk of underperformance from any one channel or distributor. Having a functional supply chain really transforms the sector and people's view of what is possible in-country. In the case of the jikokoa, Kenyans have really embraced it as their own."

SUPPLY CHAIN PAYOFFS

For consumers, robust supply chains often mean improved quality and access to after-sales service and spare parts. Quality of life improves because people can purchase affordable, reliable products that enhance health and everyday living. For manufacturers, the biggest advantage of a robust supply chain is the ability to reach a completely untapped market that is rapidly moving up the economic ladder. An efficient supply system could mean having a product available to hundreds of millions of target customers within weeks or even days of launch.

The advantages don't only apply to importers of goods. According to Prashanth Venkataramana, a mechanical engineer who is director of India operations for Essmart Global, "Developing countries will greatly benefit from the reverse logistics, where produce from smaller villages and farms can reach big cities and global markets efficiently. This can open up a large customer base globally for products that were only available in villages."

Local sourcing and manufacturing of products can lead to significant improvements in local and regional economies by creating jobs, improving health, and reducing environmental impacts. However, there can be fundamental challenges in scaling up manufacturing in many developing regions.

According to Fernandez, "You will likely need to devote considerable resources to education and training and do a lot of hand-holding to communicate your quality standards and all your expectations. You cannot assume anything or take

anything for granted because whatever you assume would be the norm, probably isn't the norm locally. Very simply, you would have to undertake a cost-benefit analysis to ultimately decide if it is worthwhile to manufacture locally or not."

BUILDING RELATIONSHIPS

Many entrepreneurs underestimate the influence that trust-based relationships have on buying decisions in developing markets. The amount of trust customers have in a product depends on how strongly their shopkeepers advocate for it. The key to shopkeeper buy-in often centers on reliable and efficient after-sales service.

In many villages, broken products become village trash because after-sales service is unavailable. Essmart Global, however, has a good reputation for not only carrying high-quality products, but also for providing high-quality, after-sales service.

"We've found that customers are willing to invest more in a product if it comes with a warranty that is actually honored by the manufacturer," Stenson said. "After-sales service can be an additional expense, but it's this trust that builds relationships in the supply chain."

In developing countries, engineers who are not local to the region often underestimate the challenges related to quality control and added time of shipping and costs of tariffs. There are other needs that may be unfamiliar to foreigners—including how to communicate effectively with local, regional, and national government bureaucrats, and ensuring proper compliance with multiple layers of laws and regulations.

"Teaming up with a financially stable, respected local partner can be a critical element in successfully constructing a supply chain," said Toby Gooley, editor of *Supply Chain Quarterly*, the publication of the Council of Supply Chain Management Professionals in Lombard, Ill. "A local partner can also help with avoiding other types of pitfalls, such as cultural *faux pas* or failure to understand the limitations of various modes of transportation at certain times of the year. For example, truck distribution may be relatively fast and cost-effective in the dry season, but during the rainy season it may be very slow and lead to late deliveries. Rail freight or even costly air shipping may make more sense, depending on the locale."

The McKinsey Global Institute predicts that by 2020 over 4 billion people will be living in urban areas and 80 percent of them will be in developing countries. In many of these countries—especially India, Indonesia, and China—major population growth is occurring in tier-3 cities and outlying rural areas. These are huge markets, sometimes challenging to reach, and they will need innovative supply chains to serve urban and rural populations.

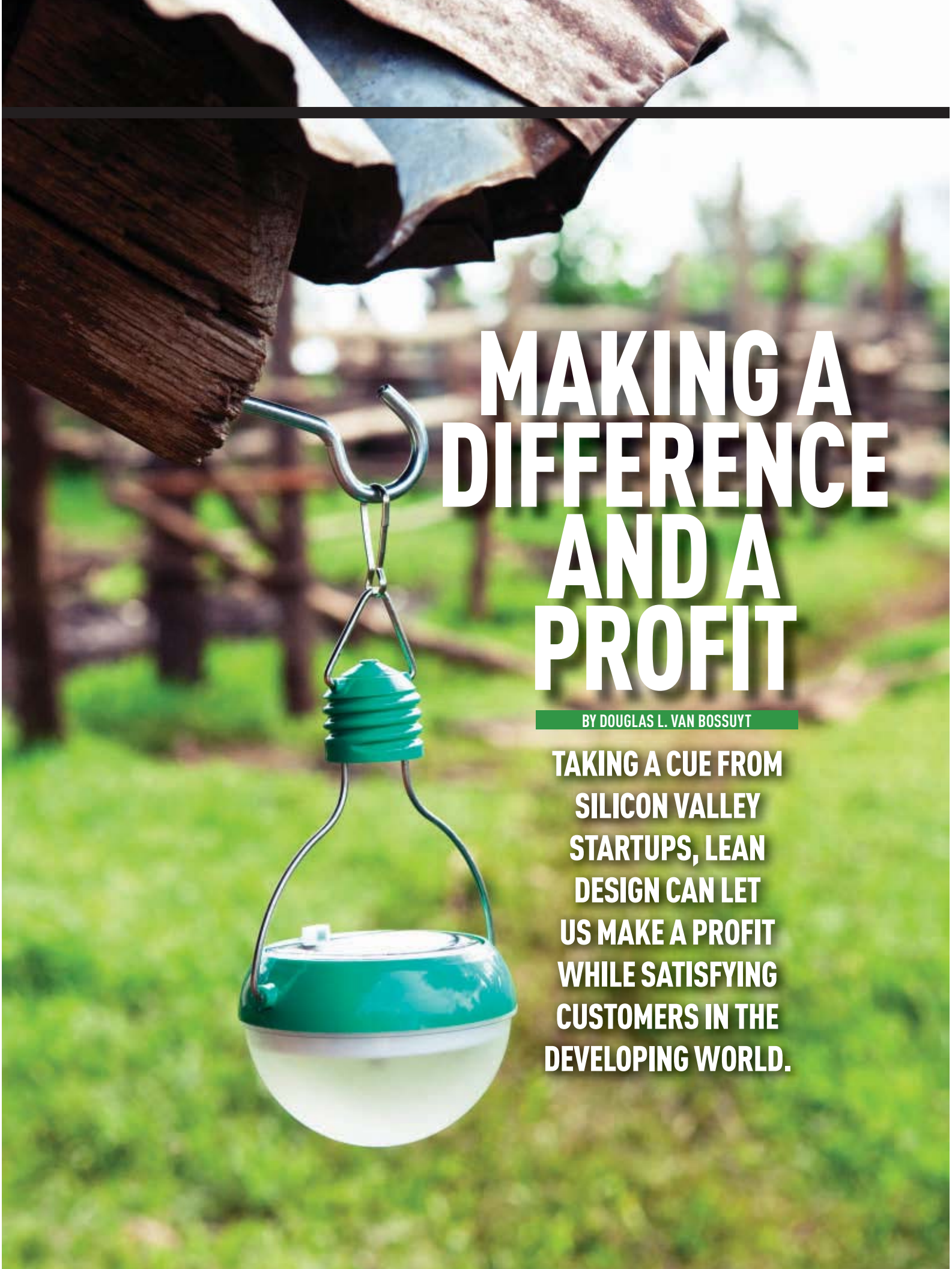
According to Cottrill at MIT, developing countries can learn much from best practices that are established in developed countries, but companies that try to simply duplicate Western supply chain designs in emerging economies will almost certainly fail.

"Each country has a unique set of demands and constraints that require very specific supply chain solutions," he said. ME

MARK CRAWFORD is an independent writer based in Madison, Wis.

"TEAMING UP WITH A FINANCIALLY STABLE, RESPECTED LOCAL PARTNER CAN BE A CRITICAL ELEMENT IN SUCCESSFULLY CONSTRUCTING A SUPPLY CHAIN,"

— TOBY GOOLEY, EDITOR, *SUPPLY CHAIN QUARTERLY*



MAKING A DIFFERENCE AND A PROFIT

BY DOUGLAS L. VAN BOSSUYT

TAKING A CUE FROM SILICON VALLEY STARTUPS, LEAN DESIGN CAN LET US MAKE A PROFIT WHILE SATISFYING CUSTOMERS IN THE DEVELOPING WORLD.

In the field of **development engineering**, the example of the massive donor-funded water project that no one uses or maintains is so iconic that it has become something of a cliché. **Ironically, the lesson that the failed water project teaches—that we as engineers need to better understand the people we are designing for—has an application so broad that many of us lose sight that we are designing for real people.** Regardless of whether a product is going to be sold and used in Washington, D.C., or Ouagadougou, engineers must keep in mind the context of where a product will be used.

The role of human nature is often overlooked when dissecting design failures in development engineering. Many failures are due to the lack of buy-in from the local communities. Organizations drop in, paternalistically tell people what is best for them, and leave behind a project for which locals feel no sense of ownership nor have any capacity to maintain.

In other cases, products that are intended for the developing world market draw from a universal template. A stove design that works well in South Asia, for instance, may be exported to East Africa or the Andes without regard to whether it makes sense in those places. Fuel sources, cooking styles, and a myriad of other factors change from region to region and even within the same small village. One size more often than not does not fit all.

ENGINEERS SHOULD ADOPT AND ADAPT SOME OF THE PRACTICES FROM SILICON VALLEY.

More generally, the traditional engineering design process, which follows a linear progression from project definition to product definition to conceptual design to product development and finally to product support, may not be the optimum means to create the most value for people at the base of the global economic pyramid. Many of the design methods and funding models used in development engineering ignore the business case. And too often, designers treat the funding agency or some important third party stakeholder as the customer, not the actual end user.

As an alternative, I believe engineers should adopt and adapt some of the practices from Silicon Valley. My research group has developed a method called Lean Design for the Developing World, or LDW for short, which

Customer feedback helped Nokero evolve the design its solar light bulb. Improvements in the N100 (below) led to the N200 (opposite).

draws from the human-centered design paradigm, traditional product design methods, and the lean startup methodology popularized by Silicon Valley enterprises.

Following LDW will provide products that are economically viable for both companies and customers, have strong market growth potential, and have a net positive impact on the customers and their communities. In essence, I believe that a capitalist approach can effectively, efficiently, and compassionately create the kinds of tangible and intangible benefits that NGOs, governments, and the international development community have long striven for.

IN DEVELOPING MARKETS, DIFFICULTY IN GATHERING THE NECESSARY DATA CAN LEAD TO LENGTHY DELAYS OR BROAD ASSUMPTIONS IN THE PRODUCT DEVELOPMENT CYCLE.

DESIGN DRIVERS

There is nothing intrinsically wrong with traditional engineering design methods, which are efficient in designing robust, innovative, market-defining products. Generally speaking, traditional design starts with a project definition phase to create a business framework and model that is driven by technology developments, market direction, or product changes. Those drivers push design teams to identify and choose products to develop, after which the next step is the development of a conceptual design which then is refined into a physical product. After the product has been released, the project goes into the product support phase.

Within the overarching design framework that many of us learned at university, there are a number of methods adopted by industry.

One example is a form of analysis known by the acronym STEEP, short for Society, Technology, Economy, Environment, and Politics. STEEP analysis attempts to derive opportunities and hidden needs by identifying broad trends, and relies on the availability of data about the economy and technological state of the target market.

Information is usually easy to come by in Europe, East Asia, and North America—where private companies and public agencies collect all sorts of data. In developing markets, however, difficulty in gathering the necessary data can lead to lengthy delays or broad assumptions in the product development cycle, and cost overruns. It increases the likelihood of project failure.

Another design method is the systems engineering formal stakeholder needs analysis method. As defined by the International Council on System Engineering (INCOSE), this analysis focuses on surveying key stakeholders to elicit formal requirements. This technique assumes a stakeholder that is well-informed and able to articulate her needs in appropriate, often technical language. Many developing world stakeholders do not have the technical background necessary to effectively communicate with engineering design teams adhering to the methods advocated by INCOSE.

Because of the paucity of high-quality information and the relative inability of stakeholders to clearly articulate their desires using technical language, traditional engineering product design techniques can be difficult to implement in the developing world and may lead to outright design failures. Failures such as the Life Straw and the One Laptop Per Child initiative—highly publicized projects that never accomplished their ambitious goals—demonstrate the risks posed by misunderstanding the needs and wants of customers, and the failures that can arise from poor or sparse information.

Several high-profile groups have used human-centered design, an increasingly popular design methodology used in developing world contexts. But it suffers from some of the same problems that STEEP or stakeholder needs analysis face, and with added challenges. Human-centered design emphasizes collecting

The Lifestraw (above) and OLPC XO-1 laptop (left) were ambitious failures.

information from relevant stakeholders, translating what was learned via field work into concrete solutions, and delivering those solutions back to the field.

Human-centered design requires a very large and sometimes prohibitive level of upfront investment, both in time (sometimes years) and money, to truly understand customers from another culture and can be limited by the inability of stakeholders to effectively relay their needs and desires to the design teams and ethnographers. Design teams may also over-emphasize what they learn from a small number of users, leading to over-customized products.

Other methods used to design for the developing world, such as co-design, implementation of philanthropic resources, and appropriate technology methods also generally require large upfront investment in time and energy before the first product is released to the market. With long lags between the inception of a product design process and production of the first fieldable product, customers become discouraged and disenfranchised, for-profit companies lose interest or go bankrupt, and funding agencies move on to fund other projects before deployment is complete. The final product is usually not a right fit for the market, and often the project will be abandoned before completion.

STARTUP CULTURE

At the Colorado School of Mines, associate teaching professor Jered Dean, research assistant Jordan Pease (since graduated), and I began looking at alternatives to those product design approaches for developing world markets. The startup culture of Silicon Valley soon became a source of inspiration.

Startups typically turn ideas into products very quickly, placing products in the hands of customers in order to generate useful data such as customer feedback, indicating what people like and dislike about a given product, and market and sales data, identifying product value. The market and sales data also quantitatively explains potential market demand between varying demographics and regions. Rapidly fielding new iterations of products as consumer needs, desires, and preferences are uncovered is key to the success of many startups.

We asked ourselves how a "lean startup" concept can be adapted to the challenges facing product designers working for the developing world. At the heart of what we call Lean Design for the Developing World, or LDW, is the idea that the market can best identify product value and drive product development. The notion of product value—for the customers and the company—must always remain the focus of the designer who implements market-based approaches to design.

The LDW method has three overarching steps: product concept and deployment; validated learning; and decision making. The three steps are iterative in nature and have a decision point that is adapted from startup culture: the design team has to make a critical decision—pivot, persevere, or cancel the project.

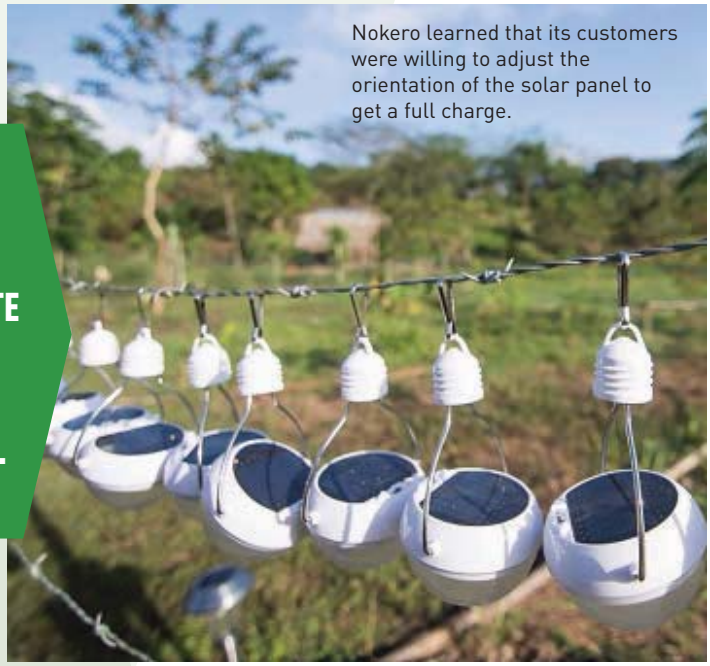
The iterative approach of lean design stresses leveraging sales data, customer feedback, and distributor feedback to evaluate and refine the important metrics of value, growth, and impact of a particular product that drive the design process and optimize the product. A product cannot be introduced to the market if it does not have positive value through return on investment to customers and profit for the company, positive market segment growth to reach many customers rather than just a few, and positive impact on customers and their communities.

The capitalist approach, we feel, provides value by developing profitable products with strong and rapid return on investment for customers, such as by replacing a kerosene lantern that requires weekly fuel purchases with a solar rechargeable electric light system, which does not need external price support or donations as part of the business model.

PRODUCT VALUE—FOR THE CUSTOMERS AND THE COMPANY—MUST ALWAYS REMAIN THE FOCUS OF THE DESIGNER WHO IMPLEMENTS MARKET-BASED APPROACHES.

At the same time, we insist that products must have a positive benefit on the customer and community through a reduction in existing hazards, risks, or problems found in the customer's daily life. An example of this would be an efficient cook stove with an integrated chimney to remove cooking fire smoke from the home and to

IMMEDIATE FEEDBACK FROM USERS ENABLED NOKERO TO QUICKLY CREATE ANOTHER PRODUCT THAT MORE ACCURATELY MATCHED MARKET NEEDS.



Nokero learned that its customers were willing to adjust the orientation of the solar panel to get a full charge.

improve combustion.

For any business to be sustainable, the market for the product must be present and sufficient to support growth. This could mean selling a home water purification system that has regional appeal.

How does LDW work? Already there are organizations using market forces to shape development engineering decisions. D-Rev, for instance, is a small, San Francisco-based nonprofit that designs medical equipment for developing countries and licenses the designs to for-profit distributors in the developing world. D-Rev relies on market-based revenue streams rather than donations or grants for growth. By being sensitive to market forces, D-Rev can create products that have an eye toward providing value to the end user rather than catching the fancy of a donor.

The design process around the Nokero solar light bulb makes for an instructive case study in LDW. Nokero, based in Denver, is a company that designs, manufactures, and distributes lighting solutions intended for regions where an electrical grid connection is costly or non-existent. This market contains an estimated 4 billion people. In many cases, people without access to reliable electricity spend up to 30 percent of their incomes on kerosene lamp fuel.

Nokero is a portmanteau of "no kerosene," and the solar lantern technologies that the company develops are effective at eliminating the need for harmful and polluting kerosene and other fossil fuels in both the developing and developed world. Without the ongoing expense of kerosene, the consumer can see a complete return on the purchase price of a Nokero solar light bulb in as little as six months.

The design team at Nokero started with three essential hypotheses. There was *value* in creating a product that would be both profitable for the business and save the customer money by providing a rapid ROI for the customer. Sales *growth* would stem from local distributor channels and word-of-mouth advertising. And by eliminating the need to burn kerosene fuels, the health and well-being of the customer would be improved, creating a positive social *impact*.

To test these original hypotheses, Nokero released the N100 solar light. From initial customer feedback, the Nokero team was able to identify where the original hypotheses were invalid. For example, the N100 was designed with panels located on the sides of the bulb and contained four separate panels that all faced in directions 90 degrees apart from one another. The orientation of panels prevented them from absorbing the maximum amount of energy because of their angle with respect to the sun.

The assumption by the design team was that the user would be willing to sacrifice a complete charge in order to eliminate the need to manually adjust the orientation of the panel during the day. In fact, Nokero found that customers were willing to adjust orientation during the day to have a fully charged bulb that lasts longer through the night.

The design of the N100 may have been flawed, but its rapid release was vital to enabling Nokero to test its value hypotheses. While the N100 lacked many of the features that were present on later, more successful iterations, it was vital in confirming some assumptions while dismissing others that Nokero initially viewed as vital to commercial success. The immediate feedback from users of the N100 enabled Nokero to quickly create another product that more accurately matched the market needs.

Faced with a decision to pivot, persevere, or end the project, Nokero pivoted and redesigned the product. The N200, which had a single solar panel located on the top of the bulb housing, was released within a year of the initial launch of the N100. The single panel had greater efficiency and reduced the complexity of the design in addition to allowing for a longer charge when the user took the time to readjust the angle of the panel to maximize solar energy collection.

However, Nokero kept the N100 in production for a time and continued to sell remaining units to customers who wished to purchase them. The sales data for the two models show how both pivoting and persevering on a product line can directly impact sales. After the first month of release, the N200 rapidly overtook the N100 in overall sales despite having a higher price. The decision to increase the effectiveness of the system and negate preconceived notions on what the market was willing to pay enabled Nokero to rapidly expand its business.

Since the release of the N200, half a dozen persevere-style iterations have been completed to further refine the N200 into several successful revised products. In addition, the company has made a number of pivots into other product lines, such as solar-power phone chargers and floating lights for use by fishermen.

Nokero's product lines have rapidly diversified and been refined to meet market needs in a variety of countries and cultures while maintaining company profitability and customer return on investment (some customers have even made businesses charging cell phones with their Nokero solar light bulbs that double as phone chargers), high growth, and a positive social impact through the reduction of health consequences from kerosene lantern soot and smoke.

As the example of Nokero shows, even with well-defined underserved markets, creating a product that provides value and growth prospects is no easy task. Nokero has defined a market and the market's needs to great success via the LDW process. The company can now deliver products to the hands of consumers who can most benefit while proving to be a profitable and viable business.

MARKET POWER

Market forces are powerful, and they help create incentives that can be used to refine designs. By looking to ensure that everyone in the supply chain gains value—from the manufacturer to distributors and finally the end user—the entrepreneurial or capitalist approach can communicate design successes and failures back to engineers and give them the incentive to make rapid adjustments.

We continue to maintain and emphatically insist that it is important to remember that, when designing products for the developing world, making money isn't the only value proposition. Engineers in this market must keep ethics in mind. The products must provide positive social impact and return on investment, not just for the end user but for communities as well.

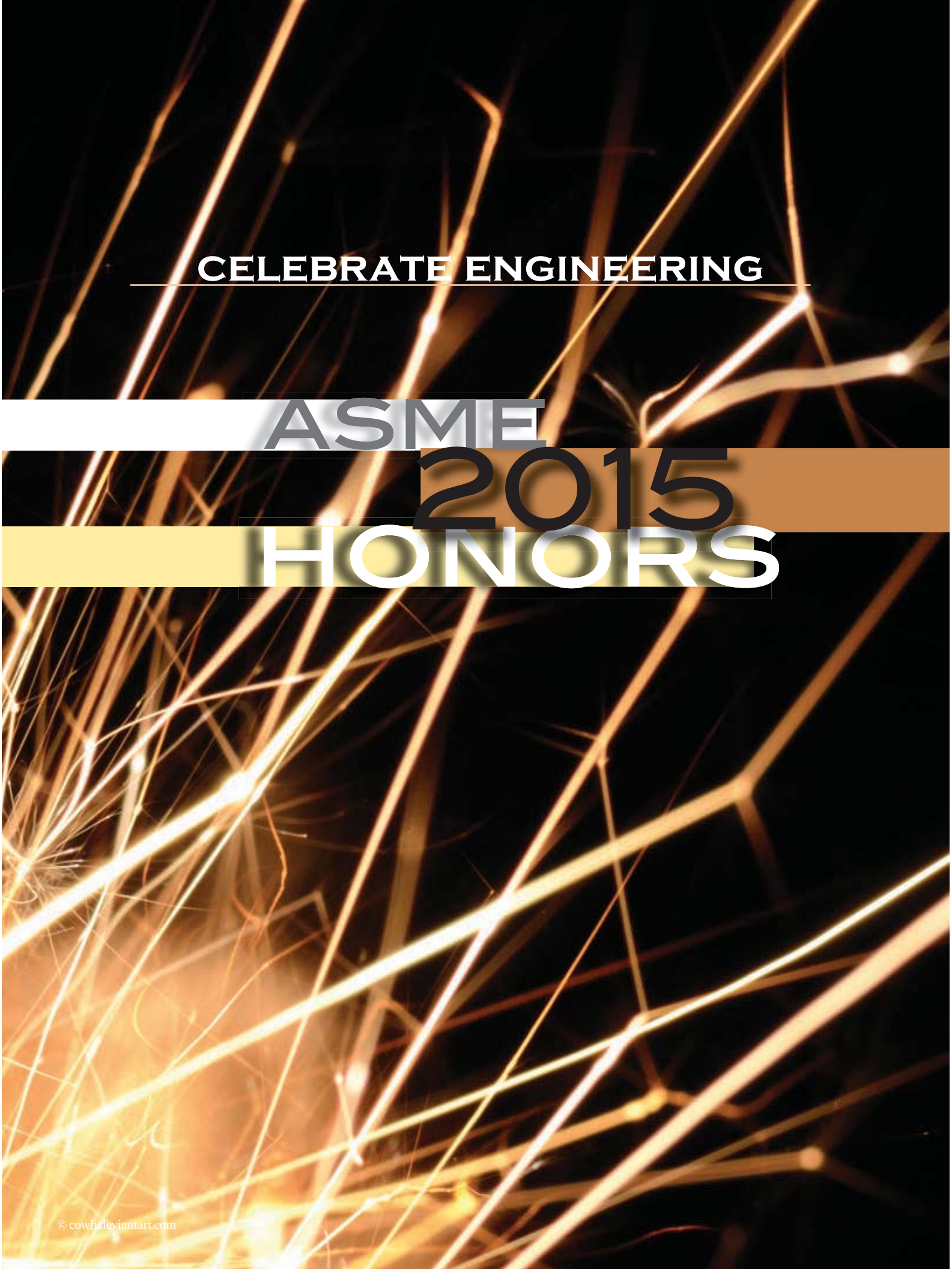
There are deeper ethical issues, too. Engineers must think hard about questions such as what sorts of materials the products are made of, where the best place is to manufacture products, and how products are disposed of at the end of their lifecycle. Engineers must also understand the social and health consequences of introducing products into the marketplace and ensure that any product does not adversely impact the customer or community.

WHEN DESIGNING PRODUCTS FOR THE DEVELOPING WORLD, MAKING MONEY ISN'T THE ONLY VALUE PROPOSITION. ENGINEERS MUST KEEP ETHICS IN MIND.

Products must be designed that have broad enough appeal to drive a sustainable market for the company. Finally, engineers must design products that rapidly return customer investment and see dividends well beyond the initial purchase period.

Through keeping the three core tenets (profit and ROI, market growth, and impact) of the LDW method at the heart of the design process, and by rapidly pivoting, persevering, or canceling a product, a for-profit company and engineering design team can develop products for the developing world that make a positive difference while also making a profit. **ME**

DOUGLAS L. VAN BOSSUYT is an assistant professor in the Department of Mechanical Engineering at the Colorado School of Mines in Golden.



CELEBRATE ENGINEERING

ASME 2015 HONORS

ROMESH C. BATRA

Honorary Membership

Romesh C. Batra, Ph.D., the Clifton C. Garvin professor at Virginia Polytechnic Institute and State University in Blacksburg, is recognized for the outstanding mentoring of more than 100 graduate students and postdoctoral fellows; and for pioneering work in applied mechanics including rubber-covered rolls, nonlinear elasticity, laminated plates, functionally graded structures, instabilities in microelectromechanical systems, mechanical characterization of carbon nanotubes, and adiabatic shear banding.

Dr. Batra spent two years (1972-74) as a postdoctoral researcher, first at Johns Hopkins University in Baltimore and then at McMaster University in Hamilton, Ontario, before starting his teaching career at the University of Missouri–Rolla (now Missouri University of Science and Technology).

In 1994 Dr. Batra joined Virginia Tech. In addition to teaching graduate level courses in continuum mechanics, nonlinear elasticity, and the finite element method, his responsibilities include mentoring graduate students in their dissertation research, collaborating in research with postdoctoral fellows and visiting scientists, and enhancing the visibility of the department and college internationally.

His group has published 400 peer-reviewed papers in high-impact journals, and he has given various plenary and memorial lectures. His graduate-level textbook titled *Elements of Continuum Mechanics* (AIAA, 2006) has been adopted at many universities, and his lectures on the subject are available on YouTube.

An ASME Fellow, Dr. Batra was organizer and co-chair of the 2002 U.S. National Congress on Theoretical and Applied Mechanics (sponsored by ASME and other professional societies), one of the largest gatherings of eminent scientists and researchers in mechanics from all over the world. Among other service, he was associate technical editor of the *Journal of Engineering Materials and Technology* (1996-2000) and chair of the Applied Mechanics Division's Elasticity Committee (1995-2000).

Dr. Batra is also a Fellow of a number of other societies.

He received his bachelor's degree in mechanical engineering (first rank) from Thapar University in Patiala, India, in 1968. He earned his master's degree in mechanical engineering from the University of Waterloo in Ontario in 1969. In 1972 he earned his Ph.D. in mechanics and materials science at Johns Hopkins University. Dr. Batra received a D.Sc. honoris causa from Thapar University in 2006; he is one of only three honored with this degree since the university was founded in 1956.

DAVID DORNFELD

M. Eugene Merchant Manufacturing Medal of ASME/SME

The M. Eugene Merchant Manufacturing Medal was established in 1986 by ASME and SME to honor an exceptional individual who has had significant influence and responsibility for improving the productivity and efficiency of the manufacturing operation.

David Dornfeld, Ph.D., the Will C. Hall family professor of engineering and chair of the mechanical engineering department at the University of California, Berkeley, is honored for outstanding contributions to manufacturing research and its implementation in industry, and for leadership in U.S. research in sustainable manufacturing.

At UC Berkeley since 1997, Dr. Dornfeld is also professor of manufacturing engineering; special division deputy, Engineering Division at Lawrence Berkeley National Laboratory; and director of the Laboratory for Manufacturing and Sustainability (lmas.berkeley.edu). His seminal contributions include the development of life cycle analysis tools which enable the prediction of the environmental impacts of manufacturing and product development, from raw material input to water and energy inputs, to manufacturing costs and disposal costs.

Previously Dr. Dornfeld was associate dean for interdisciplinary studies (2001-08) and director of the Engineering Systems Research Center (1989-98) in the College of Engineering.

He has published over 400 papers, authored three research monographs and contributed chapters to several books; and he serves in various capacities on a number of journals. He has seven patents based on his work.

Dr. Dornfeld consults on green and sustainable manufacturing, mechanical design, manufacturing productivity, sensors, automation and process modeling, and associated intellectual property issues. He writes a blog on green manufacturing at http://green-manufacturing.blogspot.com/.

An ASME Fellow, Dr. Dornfeld is a member of the ASME Press Advisory Committee and general chair of the 2015 ASME International Mechanical Engineering Education Leadership Summit. He is past chair of the Production Engineering Division and editor emeritus of the *Journal of Manufacturing Science and Engineering*. He received the Blackall Machine Tool and Gage Award in 1986 and the William T. Ennor Manufacturing Technology Award in 2010.

He is also a Fellow and member of a number of other societies.

Dr. Dornfeld earned his bachelor's degree with honors, his master's degree, and his Ph.D. in mechanical engineering from the University of Wisconsin–Madison in 1972, 1973 and 1976.

FREEMAN A. HRABOWSKI III

Ralph Coats Roe Medal

The Ralph Coats Roe Medal, established in 1972, recognizes an outstanding contribution toward a better public understanding and appreciation of the engineer's worth to contemporary society.

Freeman A. Hrabowski III, Ph.D., president of the University of Maryland, Baltimore County, is recognized for tireless efforts as a global advocate for science, technology, engineering, and mathematics, engaging the general public, lawmakers, funding agencies, and foundations to create opportunities for minorities in STEM fields to achieve the socioeconomic and intellectual integration essential for innovative, democratic societies.

Dr. Hrabowski has been serving as president of the university since 1992. His research and publications focus on science and math education, with special emphasis on minority participation and performance. He chaired the National Academies' committee that produced the 2010 report, *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads*. In 2012 President Obama named Dr. Hrabowski chair of the newly created President's Advisory Commission on Educational Excellence for African Americans.

With philanthropist Robert Meyerhoff, Dr. Hrabowski co-founded the Meyerhoff Scholars Program at UMBC in 1988. The program, recognized as a national model, is open to all high-achieving students committed to pursuing advanced degrees and research careers in science and engineering, and advancing underrepresented minorities in these fields. Based on program outcomes, Dr. Hrabowski has authored numerous articles and co-authored two books, *Beating the Odds: Raising Academically Successful African American Males* and *Overcoming the Odds: Raising Academically Successful African American Young Women* (Oxford University Press, 1998 and 2002, respectively). Recently, he authored *Holding Fast to Dreams: Empowering Youth from the Civil Rights Crusade to STEM Achievement* (Beacon Press, 2015).

Dr. Hrabowski was elected to the American Academy of Arts and Sciences, and the American Philosophical Society; and he is a Fellow of the American Association for the Advancement of Science.

Dr. Hrabowski graduated from Hampton Institute (now Hampton University) in Virginia in 1969 with highest honors in mathematics. He received his master's degree in mathematics and his Ph.D. in higher education administration and statistics from the University of Illinois at Urbana-Champaign in 1970 and 1974. Dr. Hrabowski holds honorary degrees from more than 20 institutions.

F. SUZANNE JENNICHES

Kate Gleason Award

The Kate Gleason Award, established in 2011, recognizes outstanding achievements by a female engineer. It honors the legacy of Kate Gleason, the first woman to be welcomed into ASME as a full member.

F. Suzanne Jenniches is recognized for outstanding leadership in manufacturing innovation; for setting the highest standards of excellence in producibility engineering; and for tireless efforts to increase women's participation in STEM careers.

During a career spanning more than four decades, Mrs. Jenniches was a teacher; a leader in manufacturing innovation and producibility engineering; and an ambassador for engineering as a profession for women, a role she continues in retirement.

Initially a high school biology teacher in Westminster, Md., for five years while pursuing her master's degree, Mrs. Jenniches joined Westinghouse Electric Corp. in Baltimore in 1974 as a computerized test engineer. Later, she briefly served as supervisory engineer of robotics development for electronics manufacturing before becoming operations program manager (1981-85). Appointed manager of systems and technology operations in 1986, she was responsible for transitioning defense avionics hardware programs from engineering into smooth high-rate production. Beginning in 1989 Mrs. Jenniches managed a broad cross-section of defense and nondefense profit-and-loss operating units with increasing responsibilities for Westinghouse Defense. In 1996 Westinghouse Electronic Systems was acquired by Northrop Grumman Corp.

Mrs. Jenniches served as vice president and general manager of Northrop Grumman's Government Systems Division from 2003 until her retirement in 2010. In this position, she was responsible for the Linthicum, Md., based electronic systems businesses for postal automation systems, international air defense and infrastructure systems, and homeland defense; and for operational sites in Belgium, France, the Middle East and North Africa.

Among her current efforts, Mrs. Jenniches serves on the advisory council for the Whiting School of Engineering at Johns Hopkins University. She chairs the Howard County, Md., advisory board for Project Lead the Way, a national STEM program; and, since 1997, chairs the National Academy of Engineering's EngineerGirl website.

Mrs. Jenniches earned her bachelor's degree in biology from Clarion State College, now Clarion University of Pennsylvania, in 1970; and her master's degree in environmental engineering from Johns Hopkins University's Whiting School of Engineering in Baltimore in 1979.

WEBB MARNER

Honorary Membership

Webb Marner, Ph.D., an adjunct professor of mechanical engineering at the University of California, Los Angeles, is honored for significant contributions to the mechanical engineering profession through research in enhanced heat transfer, gas-side fouling, and process engineering; outstanding teaching and student mentoring; and extensive, exemplary professional service.

Dr. Marner is an internationally recognized engineer, researcher, educator, manager, and professional leader, who has distinguished himself with significant contributions in mechanical engineering in general, and in thermal science and engineering in particular.

After graduating from Purdue University in West Lafayette, Ind., in 1962 with a bachelor's degree in mechanical engineering, Dr. Marner spent nearly two years as a quality control engineer with Sarkes Tarzian, Inc. in Bloomington, Ind. He earned his master's degree in mechanical engineering from Purdue in 1965. Following receipt of his Ph.D. from the University of South Carolina in Columbia in 1969, Dr. Marner served on the faculty of the South Dakota School of Mines and Technology in Rapid City. From 1973 to 1980 he was a member of the technical staff at Heat Transfer Research, Inc. in Alhambra, Calif.

In 1980 Dr. Marner moved to the California Institute of Technology's Jet Propulsion Laboratory in Pasadena, where he spent most of his career. His early years at JPL were devoted to energy-related research. From 1995 to 2004 he served as manager of the Measurement, Test, and Engineering Support Section, which had the primary responsibility of supporting the environmental testing of spacecraft including Cassini, Mars Pathfinder, and Mars Exploration Rover. Although he retired from JPL in 2006, Dr. Marner continued his service there as an interim employee until 2013.

He has served as a lecturer at several schools in southern California since 1980 and has taught at UCLA since 1991.

Dr. Marner has published more than 60 archival papers and technical reports, has given over 30 invited lectures, and has served as an expert reviewer for more than 15 national and international journals. He is the co-inventor on two patents.

An ASME Fellow, Dr. Marner has served the Society in numerous capacities including chair of the Los Angeles Section (1986-87), the Heat Transfer Division (1990-91), and the General Awards Committee (1991-95); and Society secretary and treasurer (2008-12). He is currently a Pension Plan trustee and associate editor of the *Journal of Thermal Science and Engineering Applications*. His ASME honors include a 50-Year Service Award in 2011.

JAMES R. RICE

ASME Medal

The ASME Medal was established in 1920 and is awarded for eminently distinguished engineering achievement.

James R. Rice, Ph.D., Mallinckrodt professor of engineering sciences and geophysics at Harvard University in Cambridge, Mass., is honored for seminal contributions in the field of applied mechanics including the J-integral method in elastic-plastic fracture mechanics that has been broadly applied in mechanical engineering and related disciplines.

Dr. Rice has been a leader in the field of applied mechanics for five decades. His pioneering ideas have had a major impact on engineering practice and have facilitated new directions of research. At Harvard since 1981, Dr. Rice was a faculty member of the Division of Engineering at Brown University in Providence, R.I., from 1965 to 1981. At Brown and Harvard, he has taught courses on topics including solid mechanics, fluid mechanics, fracture mechanics, computational mechanics, hydrology and environmental geomechanics, soil mechanics, earthquake source processes, mechanics in earth and environmental science, differential equations, and complex variable theory.

His scientific focus in recent decades is on solid and fluid mechanics, and related materials and thermal science, as directed to earth and environmental problems. His earlier work focused primarily (and exclusively up to the mid-1970s) on plastic deformation and cracking processes, principally in metals, as they arose in mechanical and materials engineering; and on related computational and analytical methodology.

Atop his extensive list of well-cited papers is "A Path Independent Integral and the Approximate Analysis of Strain Concentration by Notches and Cracks," published in ASME's *Journal of Applied Mechanics* in 1968. His discovery of a path independent integral, later called the J-integral, produced a quantum leap forward in the field of fracture mechanics.

An ASME Fellow, Dr. Rice served a four-year term on the Executive Committee of the Applied Mechanics Division, including chair (1986-87). He received the Society's Henry Hess Award in 1969, Pi Tau Sigma Gold Medal in 1971, Timoshenko Medal in 1994, and Nadai Medal in 1996.

Dr. Rice is also a Fellow and member of numerous other societies.

He earned three degrees from Lehigh University in Bethlehem, Pa.: his bachelor's degree in engineering mechanics in 1962, and his master's degree and Ph.D. in applied mechanics in 1963 and 1964. Dr. Rice holds six honorary doctoral degrees.

TERRY E. SHOUP

Honorary Membership

Terry E. Shoup, P.E., Ph.D., a professor of mechanical engineering at Santa Clara University in California, is recognized for distinctive career contributions as a researcher and educator, and through service to the engineering profession.

Dr. Shoup has been a strong contributor to engineering education for more than 45 years. He has served as a teacher, a researcher, and an administrative leader at Rutgers University in New Brunswick, N.J.; the University of Houston; Texas A&M University in College Station; Florida Atlantic University in Boca Raton, Fla.; and, currently at SCU.

He joined SCU in 1989 and, as dean of engineering (1989-2002), raised funds and developed new academic programs that enabled educational improvements. He has been serving the administrative needs of diverse university programs through positions including interim dean of education, counseling psychology and pastoral ministries (2005-06); interim vice provost for enrollment management (2006-08); interim executive director for international programs (2009-11); and interim chair of education (2014-15).

An innovator in the field of machine design and design optimization methods, Dr. Shoup's research and development activities have focused on the use of spreadsheet modules to augment the design process in the analysis and synthesis of machine elements. Early in his career, his novel research on rehabilitation equipment for disabled children landed him appearances on several of the National Easter Seals Telethons.

Dr. Shoup has authored or co-authored over 15 textbooks and more than 140 technical articles. For over 25 years he was editor-in-chief of *Mechanism and Machine Theory*.

An ASME Fellow, Dr. Shoup served as the 125th president (2006-07) of the Society. Among other positions, he was senior vice president for education (1998-2000) and senior leadership trainer for ASME's VOLT (Volunteer Orientation and Leadership Training) Academy (2012-14). He received the Society's Centennial Medal in 1980 and Gustus L. Larson Memorial Award in 1981, and a Distinguished Service Award from the ASME Council on Education in 1988.

Dr. Shoup has held leadership positions at the American Society for Engineering Education, the International Federation for the Promotion of Mechanism and Machine Science, and ABET.

He earned his bachelor's, master's, and Ph.D. in mechanical engineering from The Ohio State University in Columbus in 1966, 1967, and 1969. He earned an M.A. in pastoral ministry from SCU in 2002.

KAREN A. THOLE

George Westinghouse Gold Medal

The George Westinghouse Gold Medal was established in 1952 to recognize eminent achievement or distinguished service in the power field of mechanical engineering. Its name acknowledges the rich contribution to power development made by George Westinghouse, honorary member and 29th president of the Society.

Karen A. Thole, Ph.D., professor and head of the department of mechanical and nuclear engineering at The Pennsylvania State University in University Park, is honored for outstanding contributions toward better cooling of gas turbine airfoils.

Dr. Thole joined the faculty at Penn State in 2006. She founded the Steady Thermal Aero Research Turbine Laboratory, which houses a unique test turbine facility and is a center of excellence in heat transfer for one of the major gas turbine manufacturers.

Previously Dr. Thole held various positions at Virginia Polytechnic Institute and State University in Blacksburg (1999-2006), and was an assistant professor at the University of Wisconsin–Madison (1994-98).

Her research accomplishments include the discovery of a novel fillet design, now used in turbine designs, to reduce heat transfer arising from vortices; and the development of physics-based correlations through the acquisition of detailed data for film cooling and microchannel cooling of turbine airfoils. She has also provided high-quality, spatially resolved flowfield measurements in complex turbine passages that are regularly used for benchmarking computational fluid dynamics simulations.

Dr. Thole is a member of the NASA Advisory Council Aeronautics Committee.

She has published more than 200 archival journal and conference papers, and has supervised over 65 dissertations and theses. She holds three patents.

An ASME Fellow, Dr. Thole has served the Society in capacities including leader (2014-15) of the Energy Conversion and Storage Segment, chair (2013-14) of the board of directors for the ASME International Gas Turbine Institute, chair (2010-14) of the ASME Committee on Honors and chair (2011-14) of the ASME Department Head Executive Council. Dr. Thole also served on the ASME Center for Education board of directors (2007-13) and was a member of the Vision 2030 Committee (2008-11). She received three IGTI Best Heat Transfer Paper awards and two ASME Distinguished Service awards.

Dr. Thole earned three degrees in mechanical engineering: her bachelor's and master's degrees from the University of Illinois at Urbana-Champaign in 1982 and 1984; and her Ph.D. from The University of Texas at Austin in 1992.

JAMES A. THOMAS

Melvin R. Green Codes and Standards Medal

THE MELVIN R. GREEN CODES AND Standards Medal was established in 1976 as the Codes and Standards Medal and renamed in 1996 to honor the memory and extraordinary contributions of an ardent supporter of industrial standards.

James A. Thomas, president of ASTM International in West Conshohocken, Pa., is recognized for extraordinary leadership, and achievements on multiple fronts, to ensure voluntary consensus standards developed by ASTM and ASME continue to be afforded fair treatment as international standards under the World Trade Organization's Technical Barriers to Trade Agreement; thus facilitating the ability for national regulatory authorities and global industries to select ASME standards as their standard of choice.

Mr. Thomas has been a part of the ASTM International family for more than four decades. When he joined ASTM in 1972 he had no knowledge of standards and just two years of college. During his first three years at the organization he pursued his bachelor's degree in industrial relations with the help of the company's tuition reimbursement program, a staff benefit that continues today. Upon receipt of his degree from La Salle University in Philadelphia, he became a staff manager in the standards development division and was assigned a portfolio of technical committees, through which he built an understanding of the power of consensus and the positive impact standards can have on quality, health, and safety. He was promoted to vice president of standards development in 1983; and, in 1987, was named an ASTM executive vice president. In 1990 he received his master's degree in organization and management from La Salle. Mr. Thomas was named president of ASTM in 1992 and immediately focused organizational efforts on establishing ASTM and other major U.S.

based standards organizations as key components of the international standards community.

Mr. Thomas has been an active participant on the United States Trade Representative/Department of Commerce Advisory Committee that, in 2000, was instrumental in establishing a World Trade Organization decision that based the definition of an international standard on principles of standards development rather than organizational membership construct. He continues to advocate for broad-based acceptance and use of standards based on technical quality and market relevance, and not their label.

Since 1999, Mr. Thomas has written some 85 President's columns for *Standardization News*, an ASTM publication with approximately 30,000 readers worldwide.

Barnett-Uzgiris Product Safety Design Award

JOHN R. PUSKAR

The Barnett-Uzgiris Product Safety Design Award was established as the Triodyne Safety Award by the Design Engineering Division. In 2008, it was elevated to a Society award and renamed. The award recognizes individuals who have made significant contributions to the safe design of products through teaching, research, and professional accomplishments.

John R. Puskar, P.E., president of Prescient Technical Services LLC in Cleveland, is recognized for long-term efforts in contributing to the safety of industrial fuel systems and fired combustion equipment by developing systems for the testing and inspection of tens of thousands of pieces of equipment, thereby preventing explosions and fires and saving the lives of countless individuals; and for educating thousands of industrial workers and managers through training programs, conference presentations, and publications.

Mr. Puskar began his career at Standard Oil of Ohio in Cleveland in 1981. In 1984 he left Standard Oil and, over the next 28 years, built the largest fuels and industrial combustion safety company in the world. He sold the company, CEC Combustion, in 2011 and is applying his 30 years of fire and explosion prevention experience to the oil and gas industry.

Bergles-Rohsenow Young Investigator Award in Heat Transfer

BARATUNDE COLA

The Bergles-Rohsenow Young Investigator Award in Heat Transfer, established in 2003, recognizes a young engineer who is committed to pursuing research in heat transfer and demonstrates the potential to make significant contributions in the field.

Baratunde Cola, Ph.D., an associate professor in the George W. Woodruff School of Mechanical Engineering and, by courtesy, in the School of Materials Science and Engineering at the Georgia Institute of Technology in Atlanta, is honored for outstanding efforts that have produced seminal measurements and predictions of contact resistance in nanostructured thermal interface materials, and new insight into heat conduction in organic nanomaterials; and for the successful transfer of these developments to industry and to society through creative outreach.

Dr. Cola joined the faculty at Georgia Tech in 2009. He is co-founder and co-director of a new interdisciplinary center, Heat Lab (www.heat.gatech.edu).

Per Bruel Gold Medal for Noise Control and Acoustics

DAVID T. BLACKSTOCK

The Per Bruel Gold Medal for Noise Control and Acoustics was established in 1987 in honor of Dr. Per Bruel, who pioneered the development of sophisticated noise and vibration measuring and processing equipment. The medal recognizes eminent achievement and extraordinary merit in the field, including useful applications of the principles of noise control and acoustics to the art and science of mechanical engineering.

David T. Blackstock, Ph.D., the Eugene P. Schoch professor emeritus in the department of mechanical engineering and professor at the Applied Research Laboratories at The University of Texas at Austin; and visiting professor in the department of electrical and computer engineering at the University of Rochester in New York, is recognized for educational mentorship, and for pioneering theoretical, experimental, and computational work in nonlinear acoustics including biomedical ultrasound, high-intensity sound beams, lithotripsy, parametric arrays, shock waves and sonic booms, and propagation and absorption of high-intensity sound.

Dr. Blackstock has been with UT Austin since 1970. He has been visiting professor at the University of Rochester since 1987.

Edwin F. Church Medal

WILLIAM J. WEPFER

The Edwin F. Church Medal, established in 1972, is awarded to an individual who has rendered eminent service in increasing the value, importance, and attractiveness of mechanical engineering education.

William J. Wepfer, Ph.D., professor and the Eugene C. Gwaltney Jr. chair of the George W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta, is honored for exemplary leadership of one of the largest mechanical engineering programs in

the United States, and for continuing to advance mechanical engineering education through visionary initiatives and substantial guidance of the accreditation process.

Dr. Wepfer joined the faculty at Georgia Tech in 1980. Throughout his career he has played a role in curricular development. Dr. Wepfer implemented the first five-year bachelor's/master's program at Georgia Tech. He has also placed a strong emphasis on international opportunities through joint graduate programs with Seoul National University, South Korea, and the Universität Stuttgart, Germany.

Daniel C. Drucker Medal

KRISHNASWAMY RAVI-CHANDAR

The Daniel C. Drucker Medal, established in 1997, is conferred in recognition of distinguished contributions to the field of applied mechanics and mechanical engineering through research, teaching, and service to the community.

Krishnaswamy Ravi-Chandar, Ph.D., a professor at The University of Texas at Austin, is recognized for seminal contributions to the understanding of dynamic fracture and failure of solids.

Dr. Ravi-Chandar started his academic career at the University of Houston in 1983, and moved to UT Austin in 2000 as a professor in the department of aerospace engineering and engineering mechanics. Since 2007 he holds the Temple Foundation endowed professorship No. 1. His experimental work has provided a fundamental understanding of problems in structural integrity, fracture pattern generation, strain localization, fragmentation, blast protection, and other applications.

Thomas A. Edison Patent Award

ANDY WALKER

The Thomas A. Edison Patent Award, established in 1997, recognizes creativity of a patented device or process that has the potential of significantly enhancing some aspect of mechanical engineering.

Andy Walker, P.E., Ph.D., a principal engineer at the National Renewable Energy Laboratory in Golden, Colo., is honored for the invention of renewable energy delivery systems and methods that enable planning of renewable energy projects in a cost-optimal way, which has opened up new opportunities and resulted in renewable energy deployment at a speed and scale to make a positive difference in the economy and environment.

With the laboratory since 1993, Dr. Walker conducts engineering and economic analysis of energy efficient and renewable energy projects in government facilities such as national parks and military bases, and in various corporate facilities.

William T. Ennor Manufacturing Technology Award

ELIJAH KANNATEY-ASIBU JR.

The William T. Ennor Manufacturing Technology Award was established in 1990 by the ASME Manufacturing Engineering Division and the Alcoa Co. to recognize an individual or team for developing or contributing significantly to an innovative manufacturing technology, the implementation of which has resulted in substantial economic or societal benefits.

Elijah Kannatey-Asibu Jr., Ph.D., a professor in the department of mechanical engineering at the University of Michigan in Ann Arbor, is recognized for scholarly and pioneering work in multiple-beam laser processing, acoustic emission process monitoring, and frequency-based pattern recognition analysis of process outputs, and for outstanding contributions to educational, outreach, and diversity efforts.

With U-M since 1983, Dr. Kannatey-Asibu's groundbreaking contributions have had a significant impact on industrial applications, including welding, casting, and machining processes, with resultant savings in time, cost, and energy.

Nancy DeLoye Fitzroy and Roland V. Fitzroy Medal

GEORGE W. SUTTON

The Nancy DeLoye Fitzroy and Roland V. Fitzroy Medal, established in 2011, recognizes pioneering contributions to the frontiers of engineering leading to a breakthrough in existing technology or leading to new applications or new areas of engineering endeavor.

George W. Sutton, Ph.D., a consultant at Analysis and Applications, Inc. in Huntsville, Ala., is honored for distinguished contributions to the art and science of mechanical engineering including insights into cavitation, hypersonic heat transfer, direct energy conversion, high-energy lasers, and aero-optics; and for the invention of the first successful re-entry ablation material and the development of the transcutaneous energy supply for artificial hearts.

Throughout his career, Dr. Sutton has made engineering contributions as an employee of various companies. He retired from Cobham Analytic Solutions (SPARTA until 2008) in Arlington, Va., after serving as principal senior scientist for new projects and the Space Laser Project (1999-2011). While working full time, he served as editor-in-chief of the *AIAA Journal* for nearly 30 years (1967-96).

Fluids Engineering Award

PROMODE R. BANDYOPADHYAY

The Fluids Engineering Award was established by the Fluids Engineering Division in 1968. In 1978 it was elevated to an ASME award recognizing outstanding contributions over a period of years to the engineering profession and, in particular, to the field of fluids engineering through research, practice, or teaching.

Promode R. Bandyopadhyay, Ph.D., a senior research scientist and technical program manager at the Naval Undersea Warfare Center in Newport, R.I., is recognized for accomplishments including the classic experiment on inclined hairpin vortex turbulent boundary layer structures and Reynolds number thinning effects, transitioning flapping fin propulsion and olivo-cerebellar control to underwater vehicles, and transitioning microbial fuel cells; and for naval mentoring, leadership in microelectromechanical systems application, and U.S.–Russian–U.K. collaborations.

With the NUWC since 1991, Dr. Bandyopadhyay mentors engineers and student interns, and leads a multidisciplinary engineering group in the bridging of biological sciences and naval engineering.

Y.C. Fung Young Investigator Award

ADAM J. ENGLER

The Y.C. Fung Young Investigator Award, established in 1985, recognizes a young investigator who is committed to pursuing research in bioengineering and has demonstrated significant potential to make substantial contributions to the field.

Adam J. Engler, Ph.D., an associate professor of bioengineering at the University of California, San Diego, is recognized for innovative contributions to the field of bioengineering through research in mechanobiology and the interactions between cells and their extracellular matrix, and for translating basic scientific findings of cell-matrix interactions into important applications related to clinical medicine.

On the faculty at UC San Diego since 2008, Dr. Engler is also a resident scientist at the Sanford Consortium for Regenerative Medicine in La Jolla, Calif.

Gas Turbine Award

HARIKA S. KAHVECI
KEVIN R. KIRTLEY

Established in 1963, the Gas Turbine Award recognizes outstanding contributions to the literature of combustion gas turbines or gas turbines thermally combined with nuclear or steam power plants. The award is sponsored by the ASME International Gas Turbine Institute.

Harika S. Kahveci, Ph.D., a senior engineer at GE Aviation in Gebze, Kocaeli, Turkey; and Kevin R. Kirtley, Ph.D., executive–engineering for the heat transfer, cooling, and sealing design organization at GE Power & Water in Greenville, S.C., are recognized for the paper titled "Comparison of Temperature Profile and Heat Transfer Predictions With Statistically-Modeled Data From a Cooled 1-1/2 Stage High-Pressure Transonic Turbine" (GT2013-94242), which was presented at Turbo Expo 2013.

Dr. Kahveci began her General Electric Co. career in Greenville, S.C., in 2004. She has been a member of

the thermal systems design team at GE Aviation in Turkey since December 2012.

Dr. Kirtley began his career with Sverdrup Technology in Cleveland, where he supported the NASA Glenn Research Center's efforts on turbomachinery aerothermodynamics. He joined General Electric in 1995 and contributed in various roles before being named to his present position in 2009.

J.P. Den Hartog Award

DAVID JOHN EWINS

The J.P. Den Hartog Award, established by the Design Engineering Division in 1987 and elevated to a Society award in 2010, recognizes lifetime contributions to the teaching and practice of vibration engineering.

David John Ewins, C.Eng., D.Sc., Ph.D., distinguished research fellow at Imperial College London, is honored for outstanding educational and research activities in the area of vibration testing and turbomachinery analysis; and for efforts to bring about an integration of experimental, numerical, and theoretical methods.

Dr. Ewins began his primary academic career at Imperial College London in 1967. Initially a lecturer, he held various positions before his current appointment in 2014. Since 2007 he has held a secondary position as part-time professor of vibration engineering at the University of Bristol in the U.K.

Heat Transfer Memorial Awards

The Heat Transfer Memorial Award was established in 1959 by the Heat Transfer Division. In 1974, it was elevated to a Society award recognizing outstanding contributions to the field of heat transfer through teaching, research, practice, and design, or a combination of such activities.

JOHN H. LIENHARD V – ART

John H. Lienhard V, P.E., Ph.D., the Abdul Latif Jameel professor, and director of the Rohsenow Kendall Heat Transfer Laboratory, the Abdul Latif Jameel World Water and Food Security Lab, and the Center for Clean Water and Clean Energy at the Massachusetts Institute of Technology in Cambridge, is recognized for outstanding contributions in technology development of thermally driven desalination and temperature control of electronic test equipment; and in fundamental studies of liquid jet impingement cooling, Rayleigh-Bénard instability, thermal stratified turbulence, and extremely high heat flux heat transfer.

Dr. Lienhard joined MIT as a professor of mechanical engineering in 1988, immediately after completing his Ph.D. at the University of California, San Diego. Throughout his career, Dr. Lienhard's research has focused on heat transfer, thermal systems, and water purification.

FRANCIS A. KULACKI – GENERAL

Francis A. Kulacki, Ph.D., a professor in the department of mechanical engineering at the University of Minnesota, Minneapolis, is recognized for fundamental contributions to the understanding of convective heat transfer in porous media, and natural convection in volumetrically heated fluids and in tube bundles; and particularly for research that resulted in the development of heat transfer correlations and data sets that have proved important to both modelers and designers and that have influenced engineering for nuclear reactor safety and geologic disposal of high-level nuclear waste.

On the faculty at U of M since 1993, Dr. Kulacki previously was with Colorado State University in Fort Collins, the University of Delaware in Newark, and The Ohio State University in Columbus.

ZHUOMIN ZHANG – SCIENCE

Zhuomin Zhang, Ph.D., a professor in the George W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta, is recognized for seminal research contributions in nanoscale thermal radiation including near-field radiative heat transfer and far-field radiative properties of nanostructured materials such as thin films and multilayers, gratings, photonic crystals, and metamaterials for semiconductor manufacturing and energy harvesting.

Dr. Zhang joined the faculty at Georgia Tech in 2002. Previously he was with the University of Florida in Gainesville and the National Institute of Standards and Technology in Gaithersburg, Md.

Mayo D. Hersey Award

ALI ERDEMIR

The Mayo D. Hersey Award, established in 1965, is bestowed for distinguished and continued contributions over a substantial period of time to the advancement of the science and engineering of tribology. Distinguished contributions may result from significant original research in one or more of the many scientific disciplines related to lubrication.

Ali Erdemir, Ph.D., an Argonne distinguished fellow and senior scientist at Argonne National Laboratory in Illinois, is recognized for significant contributions to tribology including the design, synthesis, and implementation of new materials, coatings, and lubricants that can increase energy efficiency, durability, and environmental compatibility of advanced transportation systems.

Dr. Erdemir has been with Argonne since 1987. He has authored or co-authored nearly 300 research articles and 18 book and handbook chapters; edited three books; and presented more than 150 invited, keynote, and plenary talks. He holds 15 U.S. patents.

Patrick J. Higgins Medal

SHABBIR M. RAWALPINDIWALA

The Patrick J. Higgins Medal recognizes an individual who has contributed to the enhancement of standardization through contributions to the development and promotion of ASME codes and standards or conformity assessment programs. It was established in 2007 in remembrance of ASME's past vice president of the standardization department.

Shabbir M. Rawalpindiwala, manager of codes and standards at Kohler Co. in Wisconsin, is honored for contributions on numerous technical specifications for plumbing products including authoring more than 100 proposals; and for leadership on the ASME A112 Plumbing Materials and Equipment Committee, and extraordinary commitment to the harmonization process between the U.S. and Canada.

Since joining Kohler in 1998, Mr. Rawalpindiwala has been managing the regulatory aspects of the company's product line. His responsibilities include overseeing applications submitted to regulatory and certification agencies, tracking industry changes that affect product compliance and labeling, and participating on select industry committees.

Soichiro Honda Medal

THOMAS D. GILLESPIE

The Soichiro Honda Medal recognizes an individual for an outstanding achievement or a series of significant engineering contributions in developing improvements in the field of personal transportation. This medal was established in 1983 in recognition of Soichiro Honda's exemplary achievements in the field of personal transportation.

Thomas D. Gillespie, P.E., Ph.D., research professor emeritus at the University of Michigan in Ann Arbor and director of product planning at Mechanical Simulation Corp., is honored for pioneering research on vehicle dynamics and modeling, with emphasis on truck applications, that has had broad implications for traffic safety, and raised awareness of commercial vehicle performance, braking behavior, stability, and energy demand; and for serving as an educator of practicing engineers, particularly through the sharing of real-world knowledge in presentations and seminars worldwide.

Dr. Gillespie held various positions before joining U-M in 1976; he retired from U-M in 2006. In addition to his current positions, Dr. Gillespie continues to consult and teach courses to various industry groups.

Internal Combustion Engine Award

VOLKER SICK

The Internal Combustion Engine Award, established in 1966, is given in recognition of eminent achievement or distinguished contribution over a substantial period of time, which may result from research, innovation, or education in advancing the art of engineering in the field of internal combustion engines.

Volker Sick, Dr. rer. nat. habil., the Arthur F. Thurnau professor of mechanical engineering and associate vice president for research at the University of Michigan in Ann Arbor, is recognized for pioneering work in the application of laser diagnostics to study the interactions of fuel injection, flow physics, and combustion processes to further the development of new engine concepts, particularly direct-injection spark-ignition engines.

With U-M since 1997, Dr. Sick is also director of the Walter E. Lay Automotive Laboratory and has an active research program supported by industry and government sponsors.

Warner T. Koiter Medal

KAUSHIK BHATTACHARYA

The Warner T. Koiter Medal was established in 1996 to recognize distinguished contributions to the field of solid mechanics with special emphasis on the effective blending of theoretical and applied elements, and on a high degree of leadership in the international solid mechanics community. The medal honors the late Dr. Warner T. Koiter, world-renowned authority in the field of solid mechanics, and it commemorates his vast contributions as research engineer and teacher. The medal was funded by the Delft University of Technology in the Netherlands.

Kaushik Bhattacharya, Ph.D., the Howell N. Tyson Sr. professor of mechanics and professor of materials science, and the executive officer for mechanical and civil engineering at the California Institute of Technology in Pasadena, is honored for the development of novel, rigorous, and predictive methods for the multiscale behavior of modern engineering materials at scales ranging from subatomic to polycrystal, with special focus on multifunctional materials.

Dr. Bhattacharya joined the faculty at Caltech in 1993. His research concerns the mechanical behavior of solids and specifically uses theory to guide the development of new materials.

Robert E. Koski Medal

MONIKA IVANTYSYNOVA

The Robert E. Koski Medal recognizes an individual who has advanced the art and practice of fluid power motion and control through education or innovation. It was established in 2007 by the Fluid Power Systems and Technology Division to honor Robert E. Koski's contributions to the field of design engineering and dynamic systems and control.

Monika Ivantysynova, Ph.D., Maha professor of fluid power systems at Purdue University in West Lafayette, Ind., is honored for significant contributions in the area of analysis, design, and control of axial piston pumps and hydrostatic-transmission systems, which are used to transmit fluid power in automotive, industrial, and aerospace applications; and for efforts to create paths to disseminate fluid power research results.

Dr. Ivantysynova joined the Purdue faculty in 2004 and founded the Maha Fluid Power Research Center, where she continues to serve as director. She is also a thrust leader of the National Science Foundation-funded Engineering Research Center for Compact and Efficient Fluid Power. Dr. Ivantysynova is co-founder of Fluid Power Net International.

Allan Kraus Thermal Management Medal

MARTA RENCZ

The Allan Kraus Thermal Management Medal, established in 2009, recognizes individuals who have demonstrated outstanding achievements in thermal management of electronic systems and their commitment to the field of thermal science and engineering.

Marta Rencz, Dr. phil. habil., D.Sc., professor in the department of electron devices at BME–the Budapest University of Technology and Economics in Hungary, is recognized for the methodology of structure function based in situ and ex situ characterization of thermal interface materials and thermal characterization of semiconductor device packages, which has become an industry standard for the measurement of junction-to-case thermal resistance; and for structure function based test methods that led to the development of successful industrial products.

Dr. Rencz joined BME in 1973 and has held various teaching and research positions. In 1997 she co-founded and served as CEO of MicReD Ltd., a spin-off company of BME; since MicReD was acquired by Mentor Graphics in 2008, Dr. Rencz has served as research and development director.

Frank Kreith Energy Award

MICHAEL WEBBER

The Frank Kreith Energy Award was established in 2005 to honor an individual for significant contributions to a secure energy future with particular emphasis on innovations in conservation or renewable energy. Contributions may be through research, education, practice, or significant service to society that will lead to a sustainable energy future. The award was established by the Solar Energy and Advanced Energy divisions to honor Dr. Frank Kreith's contributions to solar energy and heat transfer, and was funded by Holocaust Settlement Claim No. 4931 for Nazi victims and by the Kreith family.

Michael Webber, Ph.D., deputy director of the Energy Institute, co-director of the Clean Energy Incubator, Josey centennial fellow in Energy Resources and associate professor of mechanical engineering at The University of Texas at Austin, is honored for excellence in energy research including the energy-water nexus, and for leadership in promoting energy literacy including the creation of a massive open online course and a television special.

With UT Austin since 2006, Dr. Webber trains the next generation of energy leaders at the university through research and education at the convergence of engineering, policy and commercialization.

Bernard F. Langer Nuclear Codes and Standards Award

THOMAS J. VOGAN

The Bernard F. Langer Nuclear Codes and Standards Award was established in 1977 and is presented to an individual who has contributed to the nuclear power plant industry through the development and promotion of ASME nuclear codes and standards or the ASME Nuclear Certification Program.

Thomas J. Vogan, C.P.M., P.E., a senior manager at Sargent & Lundy LLC in Chicago, is recognized for long-term contributions to ASME including service as chair of the Executive Committee and the Standards Committee on Nuclear Air and Gas Treatment, and for dedicated mentoring of junior committee members.

With Sargent & Lundy since 1989, Mr. Vogan has supported and led engineering and design efforts on a number of nuclear and fossil plants. He has also been instrumental in developing internal standards and processes to enhance the firm's mechanical engineering capabilities to meet the ever-changing rules and regulations impacting the nuclear power industry.

Gustus L. Larson Memorial Award

NIKHIL ASHOK KORATKAR

The Gustus L. Larson Memorial Award was established in 1974 and honors Gustus L. Larson, Fellow and founder of Pi Tau Sigma. It is awarded to the engineering graduate who has demonstrated outstanding achievement in mechanical engineering within 10 to 20 years following graduation.

Nikhil Ashok Koratkar, Ph.D., the John A. Clark and Edward T. Crossan chair professor in engineering at Rensselaer Polytechnic

Institute in Troy, N.Y., is honored for outstanding achievements in mechanical engineering.

A member of the faculty at RPI since 2001, Dr. Koratkar's research has focused on the synthesis, characterization and application of nanoscale material systems. He is studying the fundamental mechanical, electrical, thermal, magnetic, and optical properties of various 1-D and 2-D materials, and developing a variety of composites, coatings, and device applications of these low dimensional materials.

H.R. Lissner Medal

JAMES ANTHONY ASHTON-MILLER

The H.R. Lissner Medal was established in 1977 and is presented for outstanding accomplishments in the area of bioengineering.

James Anthony Ashton-Miller, Dr. Philos., the Albert Schultz collegiate research professor and distinguished research scientist, associate vice president for research and director of the Biomechanics Research Laboratory at the University of Michigan in Ann Arbor, is recognized for outstanding research contributions in the biomechanics of injuries, particularly neuromuscular mechanisms of fall-related injuries in the elderly, and strain-induced birth-related injuries and their sequelae in women.

Dr. Ashton-Miller has been with U-M since 1983. He, his students, and his colleagues use experimental and theoretical biomechanical approaches, advanced imaging, anatomic dissections and histology, clinical studies, and inventions to better understand the mechanism of unintentional injuries.

Machine Design Award

JORGE ANGELES

The Machine Design Award, established in 1958, recognizes eminent achievement or distinguished service in the field of machine design.

Jorge Angeles, Ph.D., the James McGill professor of mechanical engineering at McGill University in Montreal, is recognized for distinguished work on kinetostatic isotropy, qualitative synthesis, and model-based design methods, with broad industrial collaboration, that has had a significant impact on the design of robotic and other mechanical systems such as linkages, cams, gears, and clutches.

Dr. Angeles joined the faculty at McGill in 1984. Previously he was a member of the faculty at the Universidad Nacional Autónoma de México in Mexico City (1973-84).

Charles T. Main Student Leadership Awards

The Charles T. Main Award was established in 1919 to recognize, at the Society level, an undergraduate ASME student member whose leadership and service qualities have contributed, for a period of more than one year, to the programs and operations of a Student Section. In 1983, the award was expanded to include a second-place award.

JONATHAN JENNINGS – GOLD

Jonathan Jennings, an undergraduate student at the University of Missouri in Columbia is recognized for outstanding contributions to ASME including past service as president of the University of Missouri Student Section and current service at the national level as chair of the Student Section Enterprise Committee for Region 2.

Mr. Jennings is a senior at MU and expects to graduate in May 2016 with a bachelor's degree in mechanical engineering. As Student Section Enterprise Committee chair for Region 2 (2014-16), Mr. Jennings is responsible for the organization, communication and participation of all ASME Student Sections in 14 1/2 states and three Canadian provinces.

CALEB AMY – SILVER

Caleb Amy, a graduate student and research assistant at the Georgia Institute of Technology in Atlanta, is recognized for dedicated service to ASME ranging from treasurer and chair of the Student Section at the University of Central Florida to vice chair and chair of the Student Region 5 Board.

Mr. Amy maintained a 4.0 GPA and graduated from UCF in Orlando in May 2015 with a bachelor's degree in mechanical engineering and a minor in math. In August 2015 he started the M.S./Ph.D. program at Georgia Tech. He recently passed the fundamentals of engineering exam, part of the process to become a registered professional engineer.

McDonald Mentoring Award

CARLOS L. LASARTE V

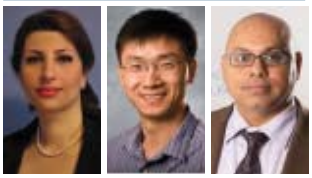
The McDonald Mentoring Award, established in 2007, recognizes the outstanding mentoring of other professionals by an engineer in industry, government, education, or private practice.

Carlos L. Lasarte V, managing director and technical advisor at Combustión, Energía y Ambiente, S.A. in Panamá, is honored for dedicated service to ASME including mentoring both professional and student members, laying the foundation for the Latin America and Caribbean District, serving as Student Sections Committee representative and District I leader, and developing several programs to benefit the membership.

Mr. Lasarte has 33 years of professional experience and is an expert in the area of corrosion, particularly the inspection and failure analysis of boilers. He has been with Combustión, Energía y Ambiente, S.A. (originally in Venezuela) since 1997.

Melville Medal

PARNIA MOHAMMADI
LIPING LIU
PRADEEP SHARMA



The Melville Medal was first awarded in 1927 and is the highest honor for the best original technical paper published in the ASME Transactions in the past two years.

Parnia Mohammadi, Ph.D., a senior mechanical specialist at S&B Engineers and Constructors, Ltd. in Houston; Liping Liu, Ph.D., an associate professor in the department of mathematics and the department of mechanical and aerospace engineering at Rutgers University in Piscataway, N.J.; and Pradeep Sharma, CPhys, Ph.D., the M.D. Anderson professor and chair of mechanical engineering, with a joint appointment in the department of physics, at the University of Houston, are recognized for the paper titled "A Theory of Flexoelectric Membranes and Effective Properties of Heterogeneous Membranes."

Dr. Mohammadi spent many years as a mechanical design engineer at various oil and gas consultant companies prior to earning her Ph.D. at the University of Houston in 2012. She joined S&B in March 2015.

Prior to joining the faculty at Rutgers, Dr. Liu was with the University of Houston (2008-11). His research focuses on continuum mechanics, multiscale-multiphysics analysis, and microstructured heterogeneous media.

Dr. Sharma joined the faculty at the University of Houston in January 2004. He is one of the co-creators of The Science Behind Harry Potter, a National Science Foundation-funded program to revitalize science education in schools.

Van C. Mow Medal

DAWN M. ELLIOTT

The Van C. Mow Medal was established by the ASME Bioengineering Division in 2004. It is presented for significant contributions to the field of bioengineering through research, education, professional development, leadership in the development of the profession, mentoring of young bioengineers, and service to the bioengineering community.

Dawn M. Elliott, Ph.D., professor and chair of biomedical engineering at the University of Delaware in Newark, is honored for significantly advancing the field of biomedical

engineering through contributions in musculoskeletal tissue structure-function research, student mentorship with a focus on women, and leadership in the ASME Bioengineering Division, including tireless efforts on the Summer Bioengineering Conference.

Prior to joining the University of Delaware in 2011, Dr. Elliott spent 12 years in the departments of orthopaedic surgery and bioengineering at the University of Pennsylvania in Philadelphia.

Nadai Medal

HUAJIAN GAO

The Nadai Medal was established in 1975 to recognize significant contributions and outstanding achievements which broaden the field of materials engineering.

Huajian Gao, Ph.D., the Walter H. Annenberg professor of engineering at Brown University in Providence, R.I., is honored for groundbreaking contributions to research of hierarchical nanotwinned metals, energy storage materials, metallic glasses, and diffusional creep of metal thin films.

At Brown University since 2006, Dr. Gao previously served as a director at the Max Planck Institute for Metals Research in Germany (2001-06) and a faculty member at Stanford University in California (1988-2002). His research has been focused on the understanding of basic principles that control mechanical properties and behaviors of materials in both engineering and biological systems.

Sia Nemat-Nasser Early Career Award

YONG ZHU

The Sia Nemat-Nasser Early Career Award recognizes research excellence in experimental, computational or theoretical aspects of mechanics of materials by a young investigator within 10 years following receipt of a Ph.D. degree. Established by the Materials Division in 2008, it was elevated to a Society award in 2012.

Yong Zhu, Ph.D., an associate professor at North Carolina State University in Raleigh, is honored for outstanding contributions to the mechanics of nanomaterials including interfacial mechanics with applications to nanomaterial-enabled stretchable electronics.

Dr. Zhu joined NC State in 2007. An associate professor of mechanical engineering and aerospace engineering, he holds joint appointments in the departments of materials science and engineering, and biomedical engineering.

Burt L. Newkirk Award

DAVID BURRIS

The Burt L. Newkirk Award was established in 1976 and is presented to an individual who has made a notable contribution in tribology research or development, as evidenced by important tribology publications prior to his or her 40th birthday.

David Burris, Ph.D., an associate professor at the University of Delaware in Newark, is honored for outstanding experimental and theoretical contributions in the area of cartilage tribology and contact mechanics.

With UD since 2008, Dr. Burris' accomplishments include articular cartilage research that has provided an understanding of the origins of osteoarthritis and the material properties necessary to develop artificial replacements. He has also made significant contributions to the field of solid lubricants and developed better measurement approaches for friction and wear.

Old Guard Early Career Award

TWISHANSH MEHTA

The Old Guard Early Career Award was established in 1994 to help the young engineer bridge the gap between college and professional life. Its intent is to bring the individual closer to the activities of ASME by providing encouragement for graduating student members to upgrade to member and actively become involved in the work of the Society.

Twishansh Mehta, E.I.T., P.M.P., manager of supermarket refrigeration at Loblaw Cos. Ltd. in Brampton, Ontario, is recognized for continuous service to ASME, from student through professional member, including numerous section, district, and society-level positions; for career accomplishments including technical, management, and leadership roles; and for inspiring volunteers through a passion for mentoring and developing engineering leaders.

For the largest food retailer in Canada, Mr. Mehta supports the retail construction and maintenance groups with technical expertise and management of the retail refrigeration category.

Rufus Oldenburger Medal

MANFRED MORARI

The Rufus Oldenburger Medal was established in 1968 and is given in recognition of significant contributions and outstanding achievements in the field of automatic control through any of the following: education, research, development, innovation, and service to the field and profession.

Manfred Morari, Ph.D., a professor in the department of information technology and electrical engineering at ETH Zurich, is honored for pioneering theoretical contributions to process control, hybrid system analysis, and model predictive control; and for practical applications to chemical process control, biomedical engineering, and automotive systems.

With ETH Zurich since 1994, Dr. Morari served as head of the department (2009-12) and head of the Automatic Control Laboratory (1994-2008). Previously he was with the California Institute of Technology in Pasadena and the University of Wisconsin–Madison.

Outstanding Student Section Advisor Award

SELIN ARSLAN

The Outstanding Student Section Advisor Award, established in 1990 as the Faculty Advisor Award, is awarded to an ASME member who is a current or former Student Section advisor whose leadership and service qualities have contributed, for at least three years, to the programs and operations of a Student Section of the Society.

Selin Arslan, Ph.D., an assistant professor in the A. Leon Linton mechanical engineering department at Lawrence Technological University in Southfield, Mich., is recognized for outstanding service as faculty advisor for the ASME Student Section at LTU including diligence and dedication that revitalized the section; and for making a positive difference in students' lives, both in and outside the classroom.

Dr. Arslan was with Columbia University in New York prior to joining the LTU faculty in 2010. At LTU she serves as the lead faculty researcher on industry sponsored projects; and, since fall 2013, has been the director of the Master of Science in Mechanical Engineering Program.

Performance Test Codes Medal

THOMAS C. HEIL

The Performance Test Codes Medal, established in 1981, is awarded to an individual or individuals who have made outstanding contributions to the development and promotion of ASME Performance Test Codes, including the Supplements on Instruments and Apparatus.

Thomas C. Heil is recognized for outstanding contributions to performance test codes, particularly for the testing of steam generators and related auxiliaries; and for developing computational methods and software for determining results, including test uncertainty, from the test data.

Mr. Heil joined The Babcock & Wilcox Co. in Barberton, Ohio, in 1963. Prior to his retirement from

B&W in 2002 he led the performance analysis group. Mr. Heil has served on a multitude of ASME performance test code committees over a span of nearly 35 years, and he remains active in ASME work.

Pi Tau Sigma Gold Medal

NEIL P. DASGUPTA

The Pi Tau Sigma Gold Medal was established in 1938 by Pi Tau Sigma in coordination with ASME to recognize outstanding achievements by a young engineering graduate in mechanical engineering within 10 years following receipt of the baccalaureate degree.

Neil P. Dasgupta, Ph.D., an assistant professor in the department of mechanical engineering at the University of Michigan in Ann Arbor, is honored for outstanding achievements in mechanical engineering within 10 years of graduation.

Dr. Dasgupta is also a faculty affiliate of the University of Michigan Energy Institute and Applied Physics Program, and the faculty advisor to the University of Michigan Solar Car Team. With U-M since 2014, Dr. Dasgupta performs research at the intersection of nanotechnology, energy science, and manufacturing. His goal is to develop scalable, low-cost techniques for the synthesis, patterning, and assembly of nanostructures on a variety of surfaces to address complex energy-related environmental challenges.

James Harry Potter Gold Medal

AHMED F. GHONIEM

The James Harry Potter Gold Medal was established in 1980 in recognition of eminent achievement or distinguished service in the appreciation of the science of thermodynamics and its applications in mechanical engineering.

Ahmed F. Ghoniem, Ph.D., the Ronald C. Crane (1972) professor of mechanical engineering at the Massachusetts Institute of Technology in Cambridge, is recognized for outstanding work on reducing the environmental impact of fossil fuels through efficiency improvement and CO_2 capture, including system-level analysis of thermodynamic cycles, component-level computational fluid dynamics and experimental diagnostics of combustion, and microscale analysis of oxy-combustion and gasification fundamentals.

Dr. Ghoniem is also director of the Center for Energy and Propulsion Research. With MIT since 1983, he has more than 30 years of professional experience in the field of computation, combustion and energy conversion.

Dixy Lee Ray Award

KAUFUI VINCENT WONG

The Dixy Lee Ray Award, established in 1998, recognizes significant achievements and contributions in the broad field of environmental protection. It honors not only those who have contributed to the enhancement of environmental engineering, but also those who have contributed to disciplines outside environmental engineering where accomplishments have indirectly influenced environmental protection.

Kaufui Vincent Wong, P.E., Ph.D., a professor at the University of Miami in Coral Gables, is honored for timely contributions that have expanded the environmental engineering knowledge base including original research using the second law of thermodynamics to evaluate system impact on the environment, early papers on the energy-water-food nexus, and a patent for an innovative boom to protect the environment against oil spills.

Dr. Wong has been with UM since 1979. Throughout his career he has performed research in the energy and environmental field, and he has taught multiple generations of students about energy conservation and the three clean sources of energy that have no fuel costs—wind, water, and the sun.

Charles Russ Richards Memorial Award

XIANG ZHANG

The Charles Russ Richards Memorial Award, established in 1944, was named in honor of a founder of Pi Tau Sigma. It is given to an engineering graduate who has demonstrated outstanding achievement in mechanical engineering for 20 years or more following graduation.

Xiang Zhang, Ph.D., the Ernest S. Kuh endowed chair professor of mechanical engineering at the University of California, Berkeley, is honored for outstanding achievements in mechanical engineering.

Dr. Zhang is also director of the Center for Scalable and Integrated Nanomanufacturing, a Nanoscale Science and Engineering Center sponsored by the National Science Foundation; director of the Materials Sciences Division at the Lawrence Berkeley National Laboratory; and a member of the Kavli Energy NanoScience Institute at UC Berkeley. Dr. Zhang's research has been frequently featured by international media including BBC, CNN, ABC, *The New York Times*, and *The Wall Street Journal*; and his achievements have been recognized by *R&D Magazine*, *Discover* magazine, and *Time* magazine.

Safety Codes and Standards Medal

BRADLEY D. CLOSSON

The Safety Codes and Standards Medal was established in 1986 to recognize contributions to the enhancement of public safety through the development and promotion of ASME safety codes and standards or through ASME safety accreditation activity.

Bradley D. Closson, principal of CRAFT Forensic Services in Bonita, Calif., is honored for more than 25 years of outstanding leadership in the proposal and development process for numerous safety standards including service as vice chair and chair of the B30 Safety Standards Committee for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings.

Mr. Closson currently provides material handling accident investigation, reconstruction, and litigation services. Prior career experience includes providing material handling safety consultation services and lifting equipment safety and compliance inspections as vice president of NACB Technical Services in San Diego (1992-2004).

R. Tom Sawyer Award

LEE S. LANGSTON

The R. Tom Sawyer Award, established in 1972, is bestowed upon an individual who has made important contributions toward the advancement of the gas turbine industry, as well as the ASME International Gas Turbine Institute, over a substantial period of time.

Lee S. Langston, Ph.D., professor emeritus at the University of Connecticut in Storrs, is recognized for technical leadership in advancing turbine aerodynamics and heat transfer, particularly pioneering research in three-dimensional flows within a turbine cascade; and for exceptional lifelong service and advocacy of IGTI.

Dr. Langston began his career in 1964 as a research engineer at Pratt & Whitney Aircraft in East Hartford, Conn. He joined the mechanical engineering faculty at UConn in 1977; since 2003 he is professor emeritus.

Milton C. Shaw Manufacturing Research Medal

Y. LAWRENCE YAO

The Milton C. Shaw Manufacturing Research Medal, established in 2009, recognizes significant fundamental contributions to the science and technology of manufacturing processes.

Y. Lawrence Yao, Ph.D., a professor in the department of mechanical engineering and director of the Advanced Manufacturing Laboratory at Columbia University in New York, is recognized for scholarly and pioneering work in advanced manufacturing, particularly model-based optimization of the transient laser machining process, microscale laser shock peening and anisotropic/heterogeneous material response, process synthesis for the laser forming of doubly curved shapes, and autogenous laser brazing of dissimilar metals.

Dr. Yao joined the faculty at Columbia in 1994 and served as department chair of mechanical engineering (2005-11). Previously he was a lecturer and senior lecturer at the University of New South Wales, Sydney (1989-1994).

Ben C. Sparks Medal

CARL D. SORENSEN
CHRISTOPHER A. MATTSON

The Ben C. Sparks Medal, established in 1990, recognizes eminent service by an individual or collaborative team in promoting innovative, authentic, practice-based, engineering design/build experiences in undergraduate mechanical engineering or mechanical engineering technology education.

Carl D. Sorensen, Ph.D., professor of mechanical engineering at Brigham Young University in Provo, Utah, and Christopher A. Mattson, Ph.D., associate professor of mechanical engineering at BYU, are recognized for outstanding contributions through the BYU Capstone, an industry-sponsored design/build program for undergraduate students, which has helped provide a new generation of Renaissance engineers with a global perspective to solve economic, environmental, cultural, and societal challenges.

Dr. Sorensen has been active in engineering design education throughout his career. One of three faculty members who developed the Capstone program at BYU in 1989, he has served as co-director, instructor, and coach. As a Capstone instructor, Dr. Sorensen has supervised nearly 550 industry-sponsored projects. He holds seven patents in friction stir welding technology.

Dr. Mattson joined the faculty at BYU in 2006. He has served as Capstone program co-director (2007-09, 2012-14) and coach (2010-11). A Fulbright scholar (2014-15), Dr. Mattson's research at the Loughborough Design School in the U.K. was aimed at advancing understanding in the area of design for the developing world with a focus on development sustainability.

Ruth and Joel Spira Outstanding Design Educator Award

ALICE M. AGOGINO

The Ruth and Joel Spira Outstanding Design Educator Award was established as a division award in 1998. The award was elevated to a Society award in 2001 to recognize a person who exemplifies the best in furthering engineering design education.

Alice M. Agogino, Ph.D., the Roscoe and Elizabeth Hughes professor of mechanical engineering and affiliated faculty at the Haas School of Business at the University of California, Berkeley, is honored for tireless efforts in furthering engineering design education including curriculum changes that blend cutting-edge design topics with state-of-the-art educational practices; promoting wide-ranging interaction between industry and students; performing game-changing design research; and mentoring the next generation of designers, educators, researchers, and engineers.

At UC Berkeley since 1984, Dr. Agogino also serves as chair of the Graduate Group in Development Engineering in the Blum Center for Developing Economies and the Product Design Master of Engineering Program of the Fung Institute for Engineering Leadership. She directs research in the BEST (Berkeley Energy and Sustainability/Expert Systems/Emergent Space Technologies) Lab, co-directs the Berkeley Institute of Design, and works with approximately 50 San Francisco Bay Area companies and nonprofits on research and educational projects in product design and sustainability.

Spirit of St. Louis Medal

DEWEY H. HODGES

The Spirit of St. Louis Medal was established in 1929 by Philip D. Ball, ASME members, and citizens of St. Louis. It is awarded for meritorious service in the advancement of aeronautics and astronautics.

Dewey H. Hodges, Ph.D., professor of aerospace engineering at the Georgia Institute of Technology in Atlanta, is honored for the development of the theory and methodology for modeling the dynamics and aeroelasticity of composite helicopter rotor blades, highly flexible slender aircraft wings, and wind turbine blades; and its implementation in the VABS software used extensively in research and industry.

Dr. Hodges has been a professor at Georgia Tech since 1986. Previously he was a research scientist at the U.S. Army Aeroflightdynamics Directorate (1970-86) located at NASA's Ames Research Center near Mountain View, Calif. During this time he was also a lecturer at Stanford.

J. Hall Taylor Medal

PETER A. MOLVIE

The J. Hall Taylor Medal was established in 1965 by the ASME Codes and Standards Board as a gift from Taylor Forge and Pipe Works to commemorate the pioneering work of J. Hall Taylor in the standardization of industrial products and safety codes for their usage. It is awarded for distinguished service or eminent achievement in the codes and standards area pertaining to the broad fields of piping and pressure vessels.

Peter A. Molvie, P.E., manager of codes and standards at Cleaver-Brooks in Milwaukee, is honored for distinguished leadership and professionalism in the advancement and recognition of ASME codes and standards for pressure equipment, and for significant contributions to the development and standardization of power and heating boiler equipment design and construction.

With Cleaver-Brooks since 1989, Mr. Molvie is responsible for divisional ASME H (heating boilers), S (power boilers), and U (pressure vessels) accreditation programs at multiple plant locations. For the past ten years he has also been responsible for senior product development engineering efforts.

Robert Henry Thurston Lecture Award

HORACIO D. ESPINOSA

The Robert Henry Thurston Lecture Award was established in 1925 in honor of ASME's first president. It provides an opportunity for a leader in pure or applied science or engineering to present to the Society a lecture that stimulates thinking on a subject of broad interest to engineers. The Robert Henry Thurston Lecture Award was elevated to a Society award in 2000.

Horacio D. Espinosa, Ph.D., the James and Nancy Farley professor of manufacturing and entrepreneurship, director of the Institute for Cellular Engineering Technologies, and director of the Theoretical and Applied Mechanics Program at the McCormick School of Engineering and Applied Sciences at Northwestern University in Evanston, Ill., is honored for sustained innovation in experimental micro and nano mechanics and its application to multiscale material characterization, from in situ electron microscopy to wave propagation experiments.

Prior to joining the faculty at Northwestern in 2000, Dr. Espinosa was with Purdue University in West Lafayette, Ind.

Timoshenko Medal

MICHAEL ORTIZ

The Timoshenko Medal was established in 1957 and is conferred in recognition of distinguished contributions to the field of applied mechanics. Instituted by the Applied Mechanics Division, it honors Stephen P. Timoshenko, world-renowned authority in the field, and it commemorates his contributions as author and teacher.

Michael Ortiz, Ph.D., the Frank and Ora Lee Marble professor of aeronautics and mechanical engineering at the California Institute of Technology in Pasadena, is recognized for seminal, groundbreaking, and creative contributions, particularly the creation of the quasicontinuum method, the formulation of an incremental variational principle to predict dislocation substructures, the development of modeling fragmentation with cohesive models, and the formulation of integrators for elastoplastic materials and variational time integrators.

At Caltech since 1995, Dr. Ortiz served as the director of Caltech's Department of Energy/Predictive Science Academic Alliance Program's Center on High-Energy Density Dynamic Response of Materials

(2008-13). Previously he was with Brown University in Providence, R.I. (1984-95).

Yeram S. Touloukian Awards

The Yeram S. Touloukian Award, a triennial award established in 1997 and initially bestowed in 2000, recognizes outstanding technical contributions in the field of thermophysical properties.

MIKHAIL A. ANISIMOV

Mikhail A. Anisimov, Ph.D., a professor in the department of chemical and biomolecular engineering and in the Institute for Physical Science and Technology at the University of Maryland in College Park, is honored for the performance of crucial experiments and introduction of new concepts including isomorphism, non-asymptotic critical behavior, complete scaling, and competing length scales; and for deepening the understanding of phase behavior, criticality, and thermophysical properties of complex fluids, liquid crystals, polymer solutions, supercooled water, and crude oils.

Dr. Anisimov has been at UMD since 1994. Among prior academic appointments, he served as professor and chair of the department of physics at the Moscow State Academy of Oil and Gas, and department head of the Institute for Oil and Gas Research of the Russian Academy of Sciences.

DAVID G. CAHILL

David G. Cahill, Ph.D., the Donald Biggar Willett professor of engineering and department head of materials science and engineering at the University of Illinois at Urbana-Champaign, is honored for sustained, pioneering contributions to heat conduction metrology including the 3-omega and optical pump-probe methods, which are pervasive in laboratories worldwide; and for landmark contributions on the minimum and ultralow thermal conductivities of solids.

Dr. Cahill joined the faculty at Illinois in 1991. He was named Willett professor of engineering in 2005 and has led the department of materials science and engineering since 2010. He has authored or co-authored more than 250 publications.

Worcester Reed Warner Medal

JOHN H. LAU

The Worcester Reed Warner Medal was established in 1930 and is awarded for outstanding contributions to the permanent literature of engineering. Contributions may be single papers, treatises or books, or a series of papers.

John H. Lau, Ph.D., senior technical advisor at ASM Pacific Technology in Hong Kong, is honored for outstanding contributions to the permanent literature of engineering through a sustained series of books, papers, and lectures on mechanical, microelectronic, and optoelectronic engineering, which established a new discipline known as the finite element analysis of microelectronic and optoelectronic components and systems.

Dr. Lau has more than 35 years of research and development and manufacturing experience in mechanical, electrical, and optical engineering-related industries. He joined ASM Pacific Technology in July 2014.

George Westinghouse Silver Medal

ANGELA VIOLI

The George Westinghouse Medals were established to recognize eminent achievement or distinguished service in the power field of mechanical engineering to perpetuate the value of the rich contribution to power development made by George Westinghouse, honorary member and 29th president of the Society. The Gold Medal was established in 1952 and the Silver Medal in 1971.

Angela Violi, Ph.D., a professor at the University of Michigan in Ann Arbor, is honored for career efforts that have focused on high-temperature chemically reacting systems, which are critical to widespread applications including energy utilization and advanced materials.

Dr. Violi joined the faculty at U-M in 2006. Initially an assistant professor in the department of mechanical engineering, she was promoted to associate professor with tenure in 2009. On Sept. 1, 2015, Dr. Violi was promoted to full professor. She holds a joint appointment in the departments of chemical engineering and biomedical engineering.

Arthur L. Williston Medal

MATTHEW D. HILL

The Arthur L. Williston Medal, established in 1954, recognizes the best paper submitted on a subject chosen to challenge the abilities of engineering students. The annual competition is open to any ASME student member or member who received a baccalaureate degree within two years of the submission deadline.

Matthew D. Hill, a second lieutenant in the U.S. Army, is recognized for the paper titled "The Role of Robotic Technology in a Manned Mission to Mars."

Second Lt. Matthew D. Hill graduated with honors from the U.S. Military Academy in West Point, N.Y., in May 2015 with a bachelor's degree in mechanical engineering. Upon graduation, he was commissioned into the U.S. Army as a second lieutenant and will serve as an engineer officer. He is currently attending the Engineer Basic Officer Leadership Course at Fort Leonard Wood, Mo., before continuing to Fort Belvoir, Va., to serve in the 12th Aviation Battalion.

Henry R. Worthington Medal

JINKOOK LEE

The Henry R. Worthington Medal, established in 1980, is bestowed for eminent achievement in the field of pumping machinery including, but not limited to, research, development, design, innovation, management, education, or literature.

Jinkook Lee, Ph.D., fluid dynamic specialist at Eaton Aerospace Group in Cleveland, is honored for three decades of outstanding contributions to the design of commercial and military jet engine fuel pumps; and for the novel design, development, and qualification of centrifugal fuel pumps for the most advanced and powerful jet engines.

Dr. Lee has 35 years of hands-on experience in thermal fluids engineering. He specializes in design, and research and development in various turbomachinery fields. He has been with Eaton Aerospace Group since 1985.

S.Y. Zamrik PVP Medal

L. IKE EZEKOYE

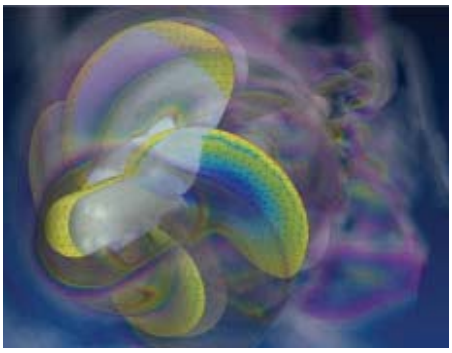
The Pressure Vessel and Piping Medal was established in 1980. Renamed the S.Y. Zamrik PVP Medal in 2010, it is bestowed for outstanding contributions in the field of pressure vessel and piping technology including, but not limited to, research, development, teaching, and significant advancements of the state of the art.

L. Ike Ezekoye, P.E., Ph.D., consultant, is recognized for providing numerous services to ASME including Codes and Standards, and the Pressure Vessels and Piping Division; for long-term contributions to the PVPD Operations, Applications and Components Technical Committee; and for significant contributions to the design, analysis, and maintenance of valves in nuclear power plants worldwide.

Dr. Ezekoye began his engineering career at Rockwell Manufacturing Co. in Barberton, Ohio. He subsequently joined the Westinghouse Water Reactor Division in Pittsburgh, where he spent more than 30 years advancing the design and application of valves in nuclear power plants and the evaluation of valve failures. Since his retirement in 2004 he has been providing consulting services to Westinghouse Electric Co.

STRESS SOLVING TOOL

CD-ADAPCO, MELVILLE, N.Y.



STAR-CCM+ v10.04 is the second release in 2015 of CD-adapco's flagship simulation tool. The highlight of the v10.04 release is a new finite element-based solid stress solver, which enables the application to offer both computational fluid dynamics and computational solid mechanics from an integrated environment. A newly implemented adjoint solver for coupled solid energy can be used in conjunction with the adjoint flow solver for performing sensitivity analysis and optimization for problems involving conjugate heat transfer.

ENTRAINED FLOW SIMULATOR

I.C. GOMES CONSULTING, NAPERVILLE, ILL.

CeSFaMB is a comprehensive simulator of boilers, furnaces, gasifiers, dryers, pyrolysers, and shale retorts operating under fluidized, moving, or entrained flow regimes. The simulator can accurately reproduce and predict operational conditions of pilot as well large-scale industrial units. The mathematical model includes all sub-models related to combustion and gasification processes and has been validated against data from operating and pilot units. The mathematical model behind CeSFaMB is based on fundamental differential equations representing mass, energy, and momentum conservation, and is applicable for a wide range of scales.

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ASME
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SPRING 2016

ASME TRAINING COURSES FOR ENGINEERS AND TECHNICAL PROFESSIONALS

FEBRUARY 2016 – ISTANBUL, TURKEY

PD442 BPV Code, Section VIII, Division 1: Design and Fabrication of Pressure Vessels
ASME STANDARDS COURSE / TOP SELLER — 8-10 Feb

PD714 BPV Code, Section VIII, Division 2: Alternative Rules – Design and Fabrication of Pressure Vessels
ASME STANDARDS COURSE / TOP SELLER — 8-10 Feb

PD767 Pressure Relief Devices: Design, Sizing, Construction, Inspection and Maintenance
ASME STANDARDS COURSE / TOP SELLER — 8-10 Feb

PD616 API 579 /ASME FFS-1 Fitness-for-Service Evaluation — 8-11 Feb

PD443 BPV Code, Section VIII, Division 1 Combo Course
ASME STANDARDS COURSE *(combines PD442 and PD441)*
SAVE UP TO €800! TOP SELLER — 8-12 Feb

PD441 Inspections, Repairs and Alterations of Pressure Equipment — 11-12 Feb

Visit: go.asme.org/istanbul2

FEBRUARY 2016 – LAS VEGAS, NEVADA USA

MasterClass Courses: Pressure Tech & Piping at ASME Boiler Code Week

MC138 Workshop: Using ASME RAM Standards to Establish a Reliability, Availability & Maintainability (RAM) Program for Critical Systems and Power Plants* NEW! — 14 Feb

MC136 Developing Effective Bolted Flange Joint Assembly Procedures Using ASME PCC-1* NEW! — 14-15 Feb

MC132 Run-or-Repair Operability Decisions for Pressure Equipment and Piping Systems Using ASME PCC-2* NEW! — 16-17 Feb

MC137 Creating and Implementing Effective Inspection Plans for Pressure Equipment and High Energy Piping Systems Using ASME PCC-3* NEW! — 18 Feb

MC127 Bases and Application Design Requirements for High Pressure Vessels in ASME Code Section VIII, Division 3* NEW! — 18-19 Feb

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*** ASME STANDARDS COURSE**

FEBRUARY 2016 – SAN ANTONIO, TEXAS USA

PD539 Bolted Joints and Gasket Behavior — 15-16 Feb

PD467 Project Management for Engineers and Technical Professionals — 15-17 Feb

PD722 Código ASME Sección IX, Soldadura: Desarrollo y Calificación de Procedimientos y Soldadore
ASME STANDARDS COURSE (presented in Spanish) — 15-17 Feb

PD765 Gas Turbine Engines – Controlling Pollutants — 15-17 Feb

PD014 ASME B31.3 Process Piping Design
ASME STANDARDS COURSE / TOP SELLER — 15-18 Feb

PD394 Seismic Design and Retrofit of Equipment and Piping — 15-18 Feb

PD632 Design in Codes, Standards and Regulations for Nuclear Power Plant Construction
ASME STANDARDS COURSE / TOP SELLER — 15-18 Feb

PD675 ASME NQA-1 Lead Auditor Training — 15-18 Feb

PD679 Selection of Pumps and Valves for Optimum System Performance — 15-18 Feb

PD581 B31.3 Process Piping Design, Materials, Fabrication, Examination and Testing Combo Course
ASME STANDARDS COURSE *(combines PD014 and PD457)*
SAVE UP TO $575! TOP SELLER — 15-19 Feb

PD601 Bolting Combo Course *(combines PD539, PD386 and PD577)* SAVE UP TO $1,275! — 15-19 Feb

PD629 Project Management Combo Course (combines PD467 and 496) SAVE UP TO $650! — 15-19 Feb

PD719 Código ASME de Calderas y Recipientes a Presión: Sección VIII, División 1 y Inspección, Reparación y Alteraciones ASME STANDARDS COURSE (presented in Spanish) — 15-19 Feb

PD386 Design of Bolted Flange Joints — 17 Feb

PD496 Preparing for the Project Management Professional Certification Exam — 18-19 Feb

PD577 Bolted Joint Assembly Principles Per PCC-1-2013
ASME STANDARDS COURSE — 18-19 Feb

PD457 B31.3 Process Piping Materials Fabrication, Examination and Testing ASME STANDARDS COURSE / TOP SELLER — 19 Feb

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MARCH 2016 – LAS VEGAS, NEVADA USA

PD107 Elevator Maintenance Evaluation — 7-8 Mar

PD475 The Engineering Manager: Engaging Today's Workforce — 7-8 Mar

PD570 Geometric Dimensioning and Tolerancing Fundamentals 1 ASME STANDARDS COURSE — 7-8 Mar

PD706 Inline Inspections for Pipelines — 7-8 Mar

PD190 BPV Code, Section IX: Welding, Brazing and Fusing Qualifications ASME STANDARDS COURSE — 7-9 Mar

PD231 Shock and Vibration Analysis — 7-9 Mar

PD389 Nondestructive Examination - Applying ASME Code Requirements (BPV Code, Section V)
ASME STANDARDS COURSE — 7-9 Mar

PD395 API 579-1/ASME FFS-1 Fitness-for-Service — 7-9 Mar

PD442 BPV Code, Section VIII, Division 1: Design and Fabrication of Pressure Vessels
ASME STANDARDS COURSE / TOP SELLER — 7-9 Mar

PD513 TRIZ: The Theory of Inventive Problem Solving — 7-9 Mar

PD618 Root Cause Analysis Fundamentals — 7-9 Mar

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MARCH 2016 – LAS VEGAS, NEVADA USA (Countinued)

PD685 The Engineering Manager: Engaging Today's Workforce and Strategic Thinking Combo Course *(combines PD475 and PD676)* SAVE UP TO $450! 7-9 Mar

PD720 Layout of Process Piping Systems 7-9 Mar

PD184 BPV Code, Section III, Division 1: Rules for Construction of Nuclear Facility Components ASME STANDARDS COURSE / TOP SELLER 7-10 Mar

PD603 GD&T Combo Course *(combines PD570 and PD561)* SAVE UP TO $825! 7-10 Mar

PD764 Introduction to Hydraulic Systems 7-10 Mar

PD443 BPV Code, Section VIII, Division 1 Combo Course ASME STANDARDS COURSE *(combines PD441 and PD442)* SAVE UP TO $680! TOP SELLER 7-11 Mar

PD686 Layout of Process Piping Systems and Optimization of Plant Layouts Utilizing 3D CAD/CAE Systems Combo Course *(combines PD720 and PD721)* SAVE UP TO $650! 7-11 Mar

PD676 Strategic Thinking 9 Mar

PD561 Geometric Tolerancing Applications and Tolerance Stacks 9-10 Mar

PD583 Pressure Relief Devices: Design, Sizing, Construction, Inspection and Maintenance ASME STANDARDS COURSE 9-11 Mar

PD115 The Gas Turbine: Principles and Applications 10-11 Mar

PD441 Inspections, Repairs and Alterations of Pressure Equipment ASME STANDARDS COURSE 10-11 Mar

PD449 Mechanical Tolerancing for Six Sigma 10-11 Mar

PD591 Developing Conflict Resolution Best Practices 10-11 Mar

PD721 Optimization of Plant Layouts Utilizing 3D CAD/CAE Systems 10-11 Mar

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MARCH 2016 – ABU DHABI, UNITED ARAB EMIRATES

PD467 Project Management for Engineers and Technical Professionals 13-15 Mar

PD618 Root Cause Analysis Fundamentals 13-15 Mar

PD643 B31.3 Process Piping Code ASME STANDARDS COURSE 13-16 Mar

PD725 BPV Code, Section VIII, Division 1: Design and Fabrication with Inspections, Repairs & Alterations of Pressure Vessels ASME STANDARDS COURSE / TOP SELLER 13-17 Mar

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PD395 API 579-1/ASME FFS-1 Fitness-for-Service 20-22 Mar

PD723 B31.4 and B31.8 Liquids and Gas Pipelines 20-22 Mar

PD642 ASME B31.1 Power Piping Code ASME STANDARDS COURSE 20-23 Mar

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MARCH 2016 – COPENHAGEN, DENMARK

PD146 Flow Induced Vibration with Applications to Failure Analysis 14-16 Mar

PD442 BPV Code, Section VIII, Division 1: Design and Fabrication of Pressure Vessels ASME STANDARDS COURSE / TOP SELLER 14-16 Mar

PD621 Grade 91 and Other Creep Strength Enhanced Ferritic Steels 14-16 Mar

PD616 API 579 /ASME FFS-1 Fitness-for-Service Evaluation 14-17 Mar

PD643 B31.3 Process Piping Code ASME STANDARDS COURSE 14-17 Mar

PD679 Selection of Pumps and Valves for Optimum System Performance 14-17 Mar

PD716 BPV Code, Section 1: Power Boilers ASME STANDARDS COURSE 14-17 Mar

PD443 BPV Code, Section VIII, Division 1 Combo Course ASME STANDARDS COURSE *(combines PD442 and PD441)* SAVE UP TO €800! TOP SELLER 14-18 Mar

PD441 Inspections, Repairs and Alterations of Pressure Equipment ASME STANDARDS COURSE 17-18 Mar

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MARCH 2016 – COPENHAGEN, DENMARK

MasterClass Courses: Pressure Technology and Piping

MC121 Design by Analysis Requirements in ASME Boiler and Pressure Vessel Code Section VIII, Division 2 – Alternative Rules* 14-15 Mar

MC113 Techniques & Methods Used in API 579-1/ASME FFS-1 for Advanced Fitness-For-Service (FFS) Assessments* 16 Mar

MC104 Bases and Application of Heat Exchanger Mechanical Design Rules in Section VIII of the ASME Boiler and Pressure Vessel Code* 17-18 Mar

MC135 Using ASME Codes to Meet the EU Pressure Equipment Directive (PED)* 17-18 Mar

...AND MORE TO BE ANNOUNCED

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*** ASME STANDARDS COURSE**

MARCH 2016 – ORLANDO, FLORIDA USA

PD382 How to Predict Thermal-Hydraulic Loads on Pressure Vessels and Piping 21-22 Mar

PD567 Design, Analysis and Fabrication of Composite Structure, Energy and Machine Applications 21-22 Mar

PD624 Two-Phase Flow and Heat Transfer 21-22 Mar

PD692 Communication Essentials for Engineers 21-22 Mar

PD077 Failure Prevention, Repair and Life Extension of Piping, Vessels and Tanks ASME STANDARDS COURSE 21-23 Mar

PD515 Dimensioning and Tolerancing Principles for Gages and Fixtures 21-23 Mar

PD702 Process Safety and Risk Management for Mechanical Engineers 21-23 Mar

PD711 ASME NQA-1 and DOE Quality Assurance Rule 10 CFR 830 ASME STANDARDS COURSE 21-23 Mar

MARCH 2016 – ORLANDO, FLORIDA USA (Continued)

PD763	Centrifugal Pumps: Testing, Design and Analysis	21-23 Mar
PD359	Practical Welding Technology	21-24 Marw
PD622	BPV Code: Plant Equipment Requirements **ASME STANDARDS COURSE**	21-24 Mar
PD013	B31.1 Power Piping Code **ASME STANDARDS COURSE**	21-25 Mar
PD192	BPV Code: Section XI: Inservice Inspection of Nuclear Power Plant Components **ASME STANDARDS COURSE**	21-25 Mar
PD673	Design and Selection of Heat Exchangers	24-25 Mar
PD584	Centrifugal Compressor Performance Analysis	24-26 Mar

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APRIL 2016 – NEW ORLEANS, LOUISIANA USA

PD100	Introduction to the Maintenance and Inspection of Elevators and Escalators	11-12 Apr
PD445	B31 Piping Fabrication and Examination **ASME STANDARDS COURSE**	11-12 Apr
PD531	Leadership and Organizational Management	11-12 Apr
PD395	API 579-1/ASME FFS-1 Fitness-for-Service	11-13 Apr
PD410	Detail Engineering of Piping Systems	11-13 Apr
PD442	BPV Code, Section VIII, Division 1: Design and Fabrication of Pressure Vessels **ASME STANDARDS COURSE / TOP SELLER**	11-13 Apr
PD506	Effective Management of Research & Development Teams and Organizations	11-13 Apr
PD633	Overview of Nuclear Codes and Standards for Nuclear Power Plants **ASME STANDARDS COURSE**	11-13 Apr
PD674	International Business Ethics and Foreign Corrupt Practices Act	11-13 Apr
PD683	Probabilistic Structural Analysis, Design and Reliability-Risk Assessment	11-13 Apr
PD620	Core Engineering Management	11-14 Apr
PD644	Advanced Design and Construction of Nuclear Facility Components Per BPV Code, Section III **ASME STANDARDS COURSE**	11-14 Apr
PD691	Fluid Mechanics, Piping Design, Fluid Transients and Dynamics	11-14 Apr
PD764	Introduction to Hydraulic Systems	11-14 Apr
PD443	BPV Code, Section VIII, Division 1 Combo Course **ASME STANDARDS COURSE** *(combines PD441 and PD442)* **TOP SELLER** **SAVE UP TO $680!**	11-15 Apr
PD602	Elevator and Escalator Combo Course *(combines PD100 and PD102)* **SAVE UP TO $905!**	11-15 Apr
PD665	BPV Code, Section I: Power Boilers **ASME STANDARDS COURSE**	11-15 Apr
PD681	International Business Ethics and Foreign Corrupt Practices Act Combo Course *(combines PD674 and PD680)* **SAVE UP TO $650!**	11-15 Apr
PD102	ASME A17.1 Safety Code and A17.2 Inspection Requirements **ASME STANDARDS COURSE**	13-15 Apr

(continued from previoust column)

PD621	Grade 91 and Other Creep Strength Enhanced Ferritic Steels	13-15 Apr
PD441	Inspections, Repairs and Alterations of Pressure Equipment **ASME STANDARDS COURSE**	13-15 Apr
PD680	Understanding the Foreign Corrupt Practices Act	14-15 Apr
PD690	Economics of Pipe Sizing and Pump Selection	14-15 Apr

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APRIL 2016 – SEATTLE, WASHINGTON USA

PD391	ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids **ASME STANDARDS COURSE**	18-19 Apr
PD539	Bolted Joints and Gasket Behavior	18-19 Apr
PD570	Geometric Dimensioning and Tolerancing Fundamentals 1 **ASME STANDARDS COURSE**	18-19 Apr
PD593	FRP Pressure Piping Construction Process	18-19 Apr
PD146	Flow Induced Vibration with Applications to Failure Analysis	18-20 Apr
PD442	BPV Code, Section VIII, Division 1: Design and Fabrication of Pressure Vessels **ASME STANDARDS COURSE / TOP SELLER**	18-20 Apr
PD571	The Taguchi Design of Experiments for Robust Product and Process Designs	18-20 Apr
PD615	BPV Code, Section III, Division 1: Class 1, 2 & 3 Piping Design **ASME STANDARDS COURSE**	18-20 Apr
PD711	ASME NQA-1 and DOE Quality Assurance Rule 10 CFR 830 **ASME STANDARDS COURSE**	18-20 Apr
PD014	ASME B31.3 Process Piping Design **ASME STANDARDS COURSE / TOP SELLER**	18-21 Apr
PD359	Practical Welding Technology	18-21 Apr
PD603	GD&T Combo Course *(combines PD570 and PD561)* **SAVE UP TO $825!**	18-21 Apr
PD679	Selection of Pumps and Valves for Optimum System Performance	18-21 Apr
PD443	BPV Code, Section VIII, Division 1 Combo Course **ASME STANDARDS COURSE** *(combines PD441 and PD442)* **SAVE UP TO $680!** **TOP SELLER**	18-22 Apr
PD581	B31.3 Process Piping Design, Materials, Fabrication, Examination and Testing Combo Course **ASME STANDARDS COURSE** *(combines PD014 and PD457)* **SAVE UP TO $575!** **TOP SELLER**	18-22 Apr
PD601	Bolting Combo Course *(combines PD539, PD386 and PD577)* **SAVE UP TO $1,275!**	18-22 Apr
PD386	Design of Bolted Flange Joints	20 Apr
PD561	Geometric Tolerancing Applications and Tolerance Stacks	20-21 Apr
PD597	Risk-Informed Inservice Testing	20-22 Apr
PD441	Inspections, Repairs and Alterations of Pressure Equipment **ASME STANDARDS COURSE**	21-22 Apr
PD577	Bolted Joint Assembly Principles Per PCC-1-2013 **ASME STANDARDS COURSE**	21-22 Apr
PD457	B31.3 Process Piping Materials Fabrication, Examination and Testing **ASME STANDARDS COURSE / TOP SELLER**	22 Apr

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MAY 2016 – HOUSTON, TEXAS USA

MasterClass Courses at 2016 OTC (Offshore Technology Conference)

MC128	ASME Code Design Requirements for High Pressure High Temperature (HPHT) Well Head Components* **NEW!**	1 May
MC134	Deepwater Riser Engineering **NEW!**	1 May

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*** ASME STANDARDS COURSE**

2016 – LAS VEGAS, NEVADA USA

PD100	Introduction to the Maintenance and Inspection of Elevators and Escalators	2-3 May
PD391	ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids **ASME STANDARDS COURSE**	2-3 May
PD268	Fracture Mechanics Approach to Life Predictions	2-4 May
PD370	B31.8 Gas Transmission and Distribution Piping Systems **ASME STANDARDS COURSE**	2-4 May
PD467	Project Management for Engineers and Technical Professionals	2-4 May
PD506	Effective Management of Research and Development Teams and Organizations	2-4 May
PD394	Seismic Design and Retrofit of Equipment and Piping	2-5 May
PD632	Design in Codes, Standards and Regulations for Nuclear Power Plant Construction **ASME STANDARDS COURSE**	2-5 May
PD675	ASME NQA-1 Lead Auditor Training	2-5 May
PD013	B31.1 Power Piping Code **ASME STANDARDS COURSE**	2-6 May
PD598	Developing a New Inservice Testing Program	2-6 May
PD602	Elevator and Escalator Combo Course *(combines PD100 and PD102)* **SAVE UP TO $905!**	2-6 May
PD629	Project Management Combo Course *(combines PD467 and 496)* **SAVE UP TO $650!**	2-6 May
PD102	ASME A17.1 Safety Code and A17.2 Inspection Requirements **ASME STANDARDS COURSE**	4-6 May
PD496	Preparing for the Project Management Professional Certification Exam	5-6 May
PD575	Comprehensive Negotiating Strategies®: Engineers and Technical Professionals	5-6 May
PD624	Two-Phase Flow and Heat Transfer	5-6 May

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MAY 2016 – ORLANDO, FLORIDA USA

MasterClass Courses: Pressure Tech & Piping at ASME Boiler Code Week

MC104	Bases and Application of Heat Exchanger Mechanical Design Rules in Section VIII of the ASME Boiler and Pressure Vessel Code*	8-9 May
MC121	Design by Analysis Requirements in ASME Boiler and Pressure Vessel Code Section VIII, Division 2 – Alternative Rules*	10-11 May
MC111	Piping Vibration Causes and Remedies – A Practical Approach*	11-12 May
MC113	Techniques and Methods Used in API 579-1/ ASME FFS-1 for Advanced Fitness-For-Service (FFS) Assessments*	12-13 May
MC117	Piping Failures - Causes and Prevention*	13 May

...AND MORE TO BE ANNOUNCED

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*** ASME STANDARDS COURSE**

MAY 2016 – DOHA, QATAR

PD642	ASME B31.1 Power Piping Code **ASME STANDARDS COURSE**	8-11 May
PD725	BPV Code, Section VIII, Division 1: Design and Fabrication with Inspections, Repairs and Alterations of Pressure Vessels **ASME STANDARDS COURSE / TOP SELLER**	8-12 May
PD570	Geometric Dimensioning and Tolerancing Fundamentals 1 **ASME STANDARDS COURSE**	15-16 May

Visit: go.asme.org/doha1

MAY 2016 – JUBAIL, SAUDI ARABIA

PD467	Project Management for Engineers and Technical Professionals	15-17 May
PD643	B31.3 Process Piping Code **ASME STANDARDS COURSE**	15-18 May
PD725	BPV Code, Section VIII, Division 1: Design and Fabrication with Inspections, Repairs & Alterations of Pressure Vessels **ASME STANDARDS COURSE / TOP SELLER**	15-19 May

Visit: go.asme.org/jubail1

MAY 2016 – LONDON, GREAT BRITAIN

PD673	Design and Selection of Heat Exchangers	9-10 May
PD615	BPV Code, Section III, Division 1: Class 1, 2 & 3 Piping Design **ASME STANDARDS COURSE**	9-11 May
PD645	BPV Code, Section IX: Welding, Brazing and Fusing Qualifications **ASME STANDARDS COURSE**	9-11 May
PD714	BPV Code, Section VIII, Division 2: Alternative Rules – Design and Fabrication of Pressure Vessels **ASME STANDARDS COURSE / TOP SELLER**	9-11 May
PD643	B31.3 Process Piping Code **ASME STANDARDS COURSE**	9-12 May
PD672	BPV Code, Section XI, Division 1: In-service Inspection 10-Year Program and 10-Year Program Updates for Nuclear Power Plant Components **ASME STANDARDS COURSE**	9-12 May
PD684	BPV Code Section III, Division 1: Rules for Construction of Nuclear Facility Components **ASME STANDARDS COURSEE**	9-13 May
PD633	Overview of Nuclear Codes and Standards for Nuclear Power Plants **ASME STANDARDS COURSE**	11-13 May

Visit: go.asme.org/london3

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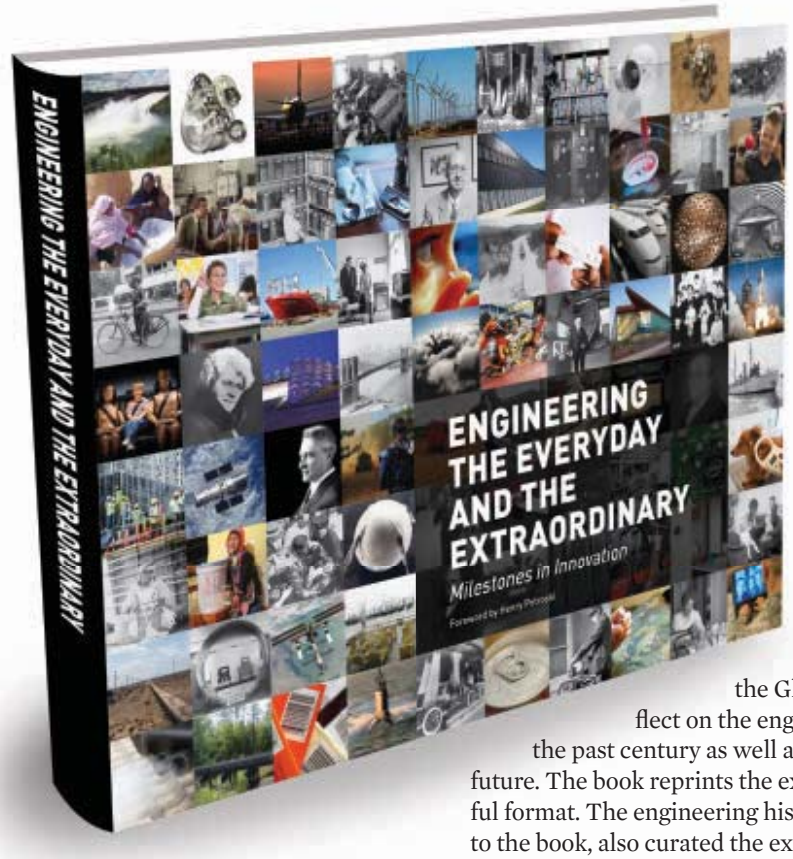


FEATURED

ENGINEERING THE EVERYDAY AND THE EXTRAORDINARY: MILESTONES IN INNOVATION

FOREWORD BY HENRY PETROSKI

ASME Press Books,
Two Park Avenue, New York, NY 10016-5990. 2015.

A companion book to the permanent exhibit at ASME's new headquarters, *Engineering the Everyday and the Extraordinary* looks at engineering achievements and their impact on everyday life. The book consists of a number of vignettes, each one telling an engineering story ranging from Ben Franklin's bifocals to the Global Positioning System. The aim is to invite us to reflect on the engineers and inventions that have shaped our world over the past century as well as the breakthroughs that are setting the stage for the future. The book reprints the exhibit's photographs, illustrations, and text in a colorful format. The engineering historian Henry Petroski, who contributed the foreword to the book, also curated the exhibit.

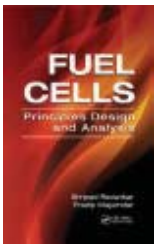
192 PAGES. $79; ASME MEMBERS, $59. ISBN: 978-0-7918-6048-9.

SURFACE EFFECTS AND CONTACT MECHANICS INCLUDING TRIBOLOGY XII: COMPUTATIONAL METHODS AND EXPERIMENTS

J. Th. M. De Hosson, M. Hadfield, and C. A. Brebbia
WIT Press, 25 Bridge Street, Billerica, MA 01821. 2015.

The biennial International Conference on Computational Methods and Experiments in Surface and Contact Mechanics brings together experts in the field of surface engineering, including tribology. This book contains 22 selected papers that were presented at the 12th conference in the series, held in 2015 in Valencia, Spain. An effort has been made to integrate new developments in surface engineering with novel ideas in the field of tribology. Particular emphasis is given to the application of advanced theories, experimental techniques, and several specific case studies. The papers in this volume highlight various new developments, both from an experimental and computational viewpoint.

280 PAGES. $240. ISBN: 978-1-8456-4950-0.



FUEL CELLS: PRINCIPLES, DESIGN, AND ANALYSIS

Shripad T. Revankar and Pradip Majumdar
CRC Press, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742. 2014.

Revankar and Majumdar consider the latest advances in fuel cell system development and deployment, with engineering and science students in mind. They provide readers with the fundamentals of fuel cell operation and design, and incorporate techniques and methods designed to analyze different fuel cell systems. A section on basic principles contains background information on fuel cells, including fundamental principles such as electrochemistry, thermodynamics, and kinetics of fuel cell reactions as well as mass and heat transfer in fuel cells. A section on design explores important characteristics associated with various fuel cell components, electrodes, electrocatalysts, and electrolytes, while a section on analysis examines phenomena characterization and modeling both at the component and system levels.

748 PAGES. $103.96. ISBN: 978-1-4200-8968-4.

MAGNESIUM MOLDING SERVICE

PROTO LABS INC., MAPLE PLAIN, MINN.

The company, a source for prototypes and low-volume production parts, has added magnesium injection molding into its rapid manufacturing services. Magnesium is a strong and lightweight metal that is increasingly being used in the automotive and aerospace industries to reduce the weight of components. The molding process, also known as thixomolding, lets product designers and engineers prototype using the same materials and processes used for production. In addition to prototypes, Proto Labs will offer production parts in quantities of up to approximately 5,000 with a typical turnaround time of 15 days.

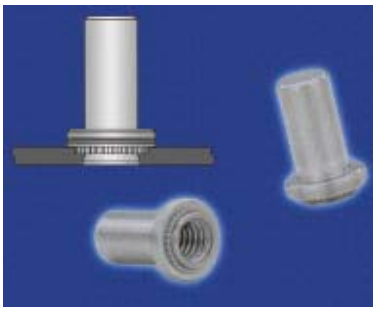
PROGRAMMABLE ROTARY ENCODERS

FRABA INC., HAMILTON, N.J.

The company's Posital unit has launched a line of programmable IXARC incremental rotary encoders for the motion control and industrial automation markets. Performance characteristics such as resolution (number of pulses per turn) and incremental pulse direction (A before B or B before A) can be modified by changing firmware parameters. The encoders are based on magnetic measurement technology and are highly resistant to shock and vibration loadings. Resolution can be set anywhere in the range of 1 to 16,384 pulses per turn. They are also available with high-performance seals for extreme environments.

SELF-CLINCHING BLIND NUTS

PENNENGINEERING, DANBORO, PA.



PEM self-clinching blind nuts permanently install into thin metal sheets to provide reusable metal threads for accepting mating screws and completing final component attachment. Their blind closed-end design effectively creates a barrier to protect the nut's threads against foreign matter and to prevent potential damage to internal components from mating screws. Nuts are available in carbon steel (Type B) and stainless steel (Type BS). They install into aluminum or steel sheets as thin as 0.040 in. (1mm). Thread sizes range from #4-40 through ¼-20 and M3 through M6. Two shank lengths are available for each thread size to accommodate minimum and thicker sheets.

SUBMISSIONS

Submit electronic files of new products and images by e-mail to **memag@asme.org**. Use subject line "New Products." *ME* does not test or endorse the products described here.

HIGH-SPEED PICK-AND-PLACE

SCHUNK USA, MORRISVILLE, N.C.

The PPU-E 15 is a high-speed pick-and-place unit designed for electronic and small-part assembly applications. With a width of just 60 mm and connections at the back, several units can be closely mounted side by side. If rotary indexing tables are used, more units can be arranged in a circle, or a smaller table diameter can be used. The PPU-E 15 is driven by a linear motor and requires 0.6 second to complete a cycle with a horizontal stroke of 145 mm, and a vertical stroke of 45 mm. At its peak, the unit achieves 100 picks per minute.

LIGHTER ISOLATION TRANSFORMERS

FOSTER TRANSFORMER, CINCINNATI.

Foster says its new lineup of high-efficiency isolation transformers is the result of two years of development to optimize performance while minimizing size. The transformers are as much as 25 percent lighter than previous generations while offering full load operating efficiencies of 97 to 99 percent. More than 250 models are available covering input voltage ranging from 120 through 600 V, and secondary voltages of 120, 208, 240, or 277 V. The new transformers reduce leakage current to ground by more than half compared to the previous generation. Increased efficiency allows cooler operation, allowing these transformers to be installed in sealed environments with no external cooling.

HIGH-EFFICIENCY BOILER

WEIL-MCLAIN, BURR RIDGE, ILL.

The Evergreen boiler has an annual fuel utilization efficiency rated at 95 percent. The South Coast Air Quality Management District has certified the unit as low NO_x, less than 20 ppm. The boiler is adaptable for light commercial or large residential applications and for single or multi-boiler installations. It can be floor standing or wall mounted. The unit features a guided setup wizard, a graphical user interface, simple controls, and 10 heating system presets for quick setup. For those who require a multiple boiler setup, as many as eight boilers can be cascaded with up to 24 programmable zones requiring no external panel.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

THE DEPARTMENT OF MECHANICAL SCIENCE AND ENGINEERING AT THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN invites applications for multiple faculty positions in all ranks. Emphasis is on the areas of manufacturing, materials, and computational science; however, excellent candidates will be considered in all areas related to mechanical science and engineering. Successful candidates are expected to teach at the undergraduate and graduate levels, establish and maintain active research programs, and provide service to the department, the university, and the profession.

Senior qualified candidates will also be considered for tenured full professor positions as part of the Grainger Engineering Breakthroughs Initiative, which is backed by a $100-million gift from the Grainger Foundation. More information regarding this unique opportunity can be found at http://graingerinitiative.engineering.illinois.edu.

A doctoral degree is required, and salary is commensurate with qualifications and experience. Full consideration will be given to applications received by December 1, 2015. Applications received after that date may be considered until positions are filled. Interviews may take place before the given date; however, no decisions will be made until after that time. The positions could start as soon as January 2016.

A full position description and information on how to apply can be found at the online jobsite http://jobs.illinois.edu. Questions regarding application procedures may be addressed to: mechse-facultyrecruiting@illinois.edu.

The University of Illinois conducts criminal background checks on all job candidates upon acceptance of a contingent offer.

Illinois is an EOE employer/Vet/Disabled

www.inclusiveillinois.illinois.edu.

SAN DIEGO STATE UNIVERSITY
Aerospace Engineering
College of Engineering

CHAIR OF AEROSPACE ENGINEERING

The Department of Aerospace Engineering at San Diego State University is seeking a visionary and strategic leader in the field of aerospace engineering and invites applications for the Chair of Aerospace Engineering. Applicants must hold an earned Ph.D. in Aerospace Engineering or a closely related discipline. The applicant must have a distinguished record of accomplishments in aerospace engineering education and research, and an outstanding record of scholarly publications and funded research. The applicant must qualify for appointment at the rank of Professor. Aerospace Engineering is one of four departments in the College of Engineering at San Diego State University. The department has nationally and internationally recognized research programs in aerodynamics, fluid mechanics, and structures. A comprehensive aero lab consisting of a mid-size (4.75 by 2.7 feet) low speed wind tunnel, a supersonic wind tunnel capable of simulating supersonic flows up to Mach number 4.5, and a pressurized water tunnel equipped with the state-of-the-art flow diagnostic and pressure measurement systems are operated within the department. Several faculty in the department are also affiliated with university research centers like the Computational Science Research Center which brings together researchers from various disciplines. Graduates from the department are among top aircraft designers in the nation. The department actively engages undergraduate students in faculty research and promotes extra-curricular professional activities as evident in championships and top positions in the AIAA Design Build and Fly competition in recent years. The department offers Bachelors, Masters and Doctoral degree programs. The ABET-accredited Bachelors degree in Aerospace Engineering is one of seven such Bachelors degrees offered in the College of Engineering. The College of Engineering is the fastest growing of SDSU's seven Colleges. A new state-of-the-art Engineering and Interdisciplinary Sciences Complex is currently under construction to significantly expand and enhance facilities in the College. Over 95,000 square feet of new space will be added. This will facilitate collaboration between engineers and scientists and promote real-world applications of research discoveries.

The city of San Diego enjoys a mild climate year-round and is a family-friendly urban environment. The metropolitan area is the hub of several leading industries, including major defense contractors and aerospace companies, and it offers extensive opportunities for developing industrial research partnerships. The faculty in the department are actively involved in collaborative research with local industry.

San Diego State University is a large, diverse, urban university and Hispanic-Serving Institution with a commitment to diversity, equity, and inclusive excellence. Our campus community is diverse in many ways, including race, religion, color, sex, age, disability, marital status, sexual orientation, gender identity and expression, national origin, pregnancy, medical condition, and covered veteran status. We strive to build and sustain a welcoming environment for all. SDSU is seeking applicants with demonstrated experience in and/or commitment to teaching and working effectively with individuals from diverse backgrounds and members of underrepresented groups. For more information about the department, college, and university, please visit http://aerospace.sdsu.edu, http://engineering.sdsu.edu, and http://www.sdsu.edu.

Review of applications will begin in December 2015 and will continue until the position is filled. Nominations are accepted. Applicants should submit curriculum vitae, statement of research interests (3 page limit), statement of teaching interests (2 page limit), a vision statement (2 page limit), and complete contact information for at least three professional references via Interfolio at http://apply.interfolio.com/31864.

Questions may be directed to the Search Committee Chair at SDSUAEsearch@engineering.sdsu.edu.

The person holding this position is considered a "mandated reporter" under the California Child Abuse and Neglect Reporting Act and is required to comply with the requirements set forth in CSU Executive Order 1083 as a condition of employment.

A background check (including a criminal records check) must be completed satisfactorily before any candidate can be offered a position with the CSU. Failure to satisfactorily complete the background check may affect the application status of applicants or continued employment of current CSU employees who apply for the position.

SDSU is a Title IX, equal opportunity employer and does not discriminate against persons on the basis of race, religion, national origin, sexual orientation, gender, gender identity and expression, marital status, age, disability, pregnancy, medical condition, or covered veteran status.

UNIVERSITY of HAWAI'I
MĀNOA

Assistant Professor (Mechanics: Mechatronics)

Position number 0082783, University of Hawaii at Manoa (UHM), College of Engineering (COE), Department of Mechanical Engineering, invites applications for a full-time, general funds, tenure track, faculty position, pending position clearance and availability of funds, to begin approximately August 1, 2016.

The University of Hawai'i is a Carnegie doctoral/research-extensive university with a strong emphasis on research and graduate education. The Department offers B.S., M.S., and Ph.D. degrees in mechanical engineering, and its undergraduate program is ABET accredited.

For more information on college research themes, please visit our college web site at www.eng.hawaii.edu. The department has active research programs in robotics, control systems, dynamical systems, nanotechnology, corrosion, biotechnology, biomedical engineering, space and ocean science & exploration, renewable energy systems & sustainability, combustion, boiling and two-phase flow, multidisciplinary design and analysis optimization, and high-performance computing.

This faculty could potentially work with UHM School of Ocean and Earth Science and Technology (SOEST) & Institute for Astronomy (IFA) and also contribute to the UH-iLab, Makers, VIP, and Entrepreneurship programs of the College. This faculty can also contribute to the following COE Research Clusters: Autonomous Systems (e.g., UAS, AUV, etc.) and Robotics, Biomedical Engineering, Renewable Energy and Island Sustainability, and Sustainable Materials and Manufacturing Technology.

Duties: Teach and develop undergraduate and graduate courses in Mechanics, Mechatronics, and Engineering Design. Develop externally funded research programs that result in publications in leading scholarly journals; present research work in leading scholarly conferences; supervise graduate students; teach via various distance delivery modes as required; and serve on departmental, college, and university committees.

Minimum qualifications: An earned Ph.D. (All-But-Dissertation, ABD, cases will be considered) in Mechanical Engineering or a closely related field. The candidate should have a background in Mechanics and Electronic aspects of Advanced Systems (such as Robotics, Applied Controls, Biomedical, Design Innovations, Renewable Energy, Manufacturing Technology, and Internet of Things-IoT). The candidate should have experiences in design, analysis, fabrication, and testing of mechatronic systems. Candidates must also show a strong commitment to teaching excellence and mentoring at the undergraduate and graduate levels.

Pay range: Commensurate with qualifications and experience.

To Apply: Only electronic applications are accepted. Applicants should follow the instructions at http://www4.eng.hawaii.edu/apply for submission instructions (The applicants should submit a cover letter specifying the position and the research area; a statement on their research interests, activities, and plans; a statement on their teaching philosophy, interests, and plan; a curriculum vitae detailing research and teaching accomplishments; copies of up to 4 relevant publications; and the names, addresses, e-mail, and telephone numbers of 4 references). For more information on the Department, please visit our website at www.me.hawaii.edu.

Inquiries: Professor Mehrdad N. Ghasemi-Nejhad, Chair, 808-956-7560, nejhad@hawaii.edu.

Review of applications will begin on February 1, 2016 and will continue until the position is filled.

The University of Hawai'i is an equal opportunity/affirmative action institution and is committed to a policy of nondiscrimination on the basis of race, sex, gender identity and expression, age, religion, color, national origin, ancestry, citizenship, disability, genetic information, marital status, breastfeeding, income assignment for child support, arrest and court record (except as permissible under State law), sexual orientation, national guard absence, or status as a covered veteran.

Individuals with disabilities who need a reasonable accommodation for the application or hiring process are encouraged to contact the EEO/AA coordinator(s) for the respective campus.

Employment is contingent on satisfying employment eligibility verification requirements of the Immigration Reform and Control Act of 1986; reference checks of previous employers; and for certain positions, criminal history record checks.

In accordance with the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act, annual campus crime statistics for the University of Hawai'i may be viewed at: http://ope.ed.gov/security/, or a paper copy may be obtained upon request from the respective UH Public Safety or Administrative Services Office.

1865 THE UNIVERSITY OF MAINE

Department Chair and Richard C. Hill Professor of Mechanical Engineering

The Mechanical Engineering Department, University of Maine, Orono, Maine, invites applications for the position of Chair of the department and Richard C. Hill Professor of Mechanical Engineering. The department offers B.S. (ABET accredited), M.S., and Ph.D. degrees in Mechanical Engineering. The department has 14 full-time regular faculty. This number is expected to expand to 15 by fall 2016. In addition to traditional mechanical engineering focuses, undergraduates can choose concentrations or minors in aerospace engineering, robotics, renewable energy, and ocean and marine engineering. The department has a robust research program with faculty engaged in interdisciplinary research in the Advanced Manufacturing Center; Advanced Structures and Composites Center; Laboratory for Surface Science and Technology; Marine Sciences; and Earth and Climate Sciences.

Qualified applicants for the position are expected to bring outstanding leadership and administrative skills to the department, have a strong research record, articulate a vision for growing the research enterprise in the department, and have the ability to build strong relationships with academic departments and research centers across campus as well as external constituencies including potential students, alumni, and corporations. Applicants must be committed to quality undergraduate and graduate education. A strong background in mechanical engineering or closely related discipline, and a Ph.D. are required. The candidate's credentials must be commensurate with appointment as a full professor with tenure in the department.

Applications should include a resume, statement of professional interests and vision, and names, affiliations, and contact information (including e-mail addresses) of at least three references. Applications should be submitted to the Department of Human Resources via https://umaine.hiretouch.com. Review of applications will begin November 15, 2015 and continue until the position is filled.

The University of Maine is an EEO/AA employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, sexual orientation, age, disability, protected veteran status, or any other characteristic protected by law.

KANSAS STATE UNIVERSITY | Mechanical and Nuclear Engineering

TENURE-TRACK FACULTY POSITION

The Department of Mechanical and Nuclear Engineering at Kansas State University is seeking excellent applicants, especially women and underrepresented minorities, with a background in mechanical or nuclear engineering or a related field for a tenure-track position at all levels (Assistant, Associate, or Full Professor). Outstanding candidates will be considered for several open endowed positions. The areas of interest include, but are not limited to, composite and nano-materials, energy systems, computational fluid dynamics, autonomous and intelligent systems, radiation detection and sensors, and other emerging areas. Qualifications include a doctorate in mechanical or nuclear engineering. A successful candidate will be expected to develop internationally-recognized, externally-funded, sustainable research program, and make significant contributions to the department's teaching and service responsibilities. The department has strong research programs in composite fabric mechanics, nanomaterials and processes, experimental solid mechanics, indoor environmental engineering, condensation heat transfer, interfacial transport phenomena, radiation detection and applications, and nuclear reactor analysis. The College of Engineering is undergoing rapid expansion and will be hiring 35 additional faculty over the next five years.

The department has 27 faculty members with annual research expenditures of approximately $5 M/yr and approximately 950 undergraduate and graduate students. More information may be found at http://www.mne.ksu.edu. The College of Engineering is located on the main Kansas State campus in Manhattan, KS. Manhattan is a vibrant family oriented city in the scenic Flint Hills. It is the cultural and business hub of a tri-county area community of over 200,000 residents (see www.manhattan.org).

Applicants should email a single electronic pdf file to mnebiz@ksu.edu that includes a letter of application, vita, statements of teaching and research interests, and contact information for five professional references. Review of applications will begin November 1, 2015 and continue until the position is filled.

Kansas State University is an equal opportunity employer of individuals with disabilities and protected veterans, and actively seeks diversity among its employees. Background check required.

UNT
UNIVERSITY OF NORTH TEXAS

The University of North Texas (UNT) invites applications for the following faculty positions in the **Department of Mechanical and Energy Engineering (MEE)**.

Position 1: Associate or full professor with background in thermal/fluids including, but not limited to, multi-scale transport phenomena, advance cooling, building energy systems, and alternative and renewable energy.

Position 2: Assistant or associate professor with interests and background in Mechanics and Manufacturing including, but not limited to, advanced solid mechanics, design, additive manufacturing, or mechatronics. The candidates are expected to teach MEE undergraduate and graduate courses, develop a strong research program funded by external sources, support and mentor graduate students, and provide service to the University and the profession. Minimum qualifications include an earned doctorate in mechanical engineering or a closely related field.

Position 3: Full-time, clinical associate professor or clinical professor with a five-year appointment renewable annually, depending on performance and the availability of funding. The position can start as early as Spring 2016. The primary responsibility is teaching at the undergraduate level, including the senior capstone design course. A candidate must have primary professional expertise in the practice context of engineering. Strong written and verbal communication skills are required. Industrial experience is preferred.

All applicants must submit an online application to http://facultyjobs.unt.edu; search Mechanical and Energy Engineering for appropriate positions listed above. Complete applications will be reviewed starting November 1, 2015, and continue until the position is filled. For more information about UNT and MEE please visit http://engineering.unt.edu/mechanicalandenergy/. The University of North Texas is an AA/ADA/EOE committed to diversity in its educational programs.

AUBURN UNIVERSITY
SAMUEL GINN COLLEGE OF ENGINEERING
AEROSPACE

MULTIPLE TENURE-TRACK FACULTY POSITIONS

The Department of Aerospace Engineering at Auburn University invites applications for multiple tenure track faculty positions at the assistant or associate professor rank. Exceptional candidates may be considered for the prestigious **Walt and Virginia Woltosz Professorship**. Applicants with expertise in all areas related to aerospace engineering are invited to apply. Applicants must have an earned doctorate in aerospace engineering, mechanical engineering, or a closely related field. They will be expected to fully contribute to the department's mission and the development of a strong, nationally recognized, funded research program.

Auburn's Aerospace Engineering has a long-standing legacy that begins at the turn of the twentieth century and extends rather seamlessly from the Wright Brothers to the Space Station, and from the Aeronautical Program that evolved under the leadership of Robert Knapp (1907) to the Aerospace Engineering Department, which took off under the direction of Robert Pitts (1942).

Chartered in 1856, Auburn's unique campus is fabled for its beauty (ranked seventh in the nation). The Samuel Ginn College of Engineering, the most prestigious engineering college in Alabama, produces more than one third of the state's engineering graduates. Its Fall'14 enrollment included 4,618 undergraduates and 921 graduates. The college was recently ranked 28th among public universities while its graduate programs were ranked 37th. Auburn is located 90 miles southwest of Atlanta on I-85, 50 miles of Montgomery.

Applicants can submit a cover letter, CV, research vision, teaching philosophy, and three references at: http://aufaculty-positions.peopleadmin.com/postings/1247

Cover letters may be addressed to: Dr. Joseph Majdalani, Search Committee Chair, 211 Davis Hall, Auburn, AL 36849. The applicant review process will begin Dec. 14, 2015 and continue until successful candidates are identified. The candidates selected for these positions must be able to meet eligibility requirements to work in the U.S. at the time of appointment and continue working legally for the proposed term of employment. Additional information may be found at: http://www.eng.auburn.edu/aero/

AU is an EEO/Vet/Disability employer.

EPFL
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Faculty Position in Solid Mechanics

at Ecole polytechnique fédérale de Lausanne (EPFL)

The Institute of Mechanical Engineering is soliciting applications for a faculty position at the level of **tenure-track assistant professor or (tenured) associate professor** for researchers with interests in Solid Mechanics.

Researchers working in any areas of **solid mechanics** – including but not limited to nano-mechanics, mechanics of energy storage materials, metamaterials, soft materials, and biomaterials – are encouraged to apply. The Institute has a particular interest in experimental research. Applicants should have a demonstrated record of achievement in the field.

As a faculty member of the School of Engineering, the successful candidate will be expected to initiate an independent and creative research program and participate in undergraduate and graduate teaching. Internationally competitive salaries, start-up resources and benefits are offered.

EPFL, with its main campus located in Lausanne, Switzerland, is a dynamically growing and well-funded institution fostering excellence and diversity. As a technical university covering essentially the entire palette of engineering and science, EPFL offers a fertile environment for research cooperation between different disciplines. EPFL has a highly international environment that is multi-lingual and multi-cultural, with English often serving as a common interface.

Applications should include a cover letter with a statement of motivation, curriculum vitae, list of publications and patents, and a concise statement of research and teaching interests. Applicants for assistant professor should request five letters of recommendation to be uploaded to the recruitment web site, while applicants for associate professor should provide the names and addresses of at least five potential recommenders. Applications must be uploaded in PDF format to the recruitment web site:

http://go.epfl.ch/igm-solid

Formal evaluation of candidates will begin on
15 December 2015.

Enquiries may be addressed to:
Prof. William Curtin
Search Committee Chair
e-mail: igm-solid@epfl.ch

For additional information on EPFL, please consult the web sites: www.**epfl.ch, sti.epfl.ch** and **igm.epfl.ch.**

EPFL is committed to increasing the diversity of its faculty, and strongly encourages women to apply.

Penn Engineering

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE AT THE UNIVERSITY OF PENNSYLVANIA is growing its faculty by 33% over the next five years. As part of this initiative, the Department of Mechanical Engineering and Applied Mechanics is engaged in an aggressive, multi-year hiring effort for multiple tenure-track positions at the Assistant, Associate, and Full Professor levels.

We seek applicants with exceptional research achievement and future promise, a commitment to excellence in undergraduate and graduate education in mechanical engineering, and a dedication to service and collegiality. Candidates should couple with the department's core strengths in mechanical systems, mechanics of materials, fluid mechanics, and thermal sciences. Applicants in all areas related to mechanical engineering will be considered; particular areas of interest are: (1) robotics and controls, (2) manufacturing, and (3) energy technology. Candidates whose research can contribute to school-wide cross-cutting initiatives in human health, scientific computing, and nanoscale engineering are particularly encouraged to apply. Applicants should submit their applications electronically at the website: http://facultysearches.provost.upenn.edu/postings/709.

The Department maintains strong collaborations with all other engineering departments, the School of Arts and Sciences, the Perelman School of Medicine, the Wharton School of Business, and the School of Design. Faculty engage strongly with leading centers including the General Robotics, Automation, Sensing, and Perception (GRASP) Laboratory, the Penn Institute for Computational Science (PICS), and the Laboratory for Research on the Structure of Matter (LRSM). The Department encourages candidates who can leverage and add to these relationships. Successful candidates will conduct innovative, leading research programs benefiting from Penn's strong interdisciplinary tradition and excellent facilities such as the new Singh Center for Nanotechnology. We are especially interested in candidates whose interests are aligned with the School's new strategic plan (http://www.seas.upenn.edu/PennEngineering2020). Candidates who enrich the diversity of our community are strongly encouraged to apply.

The University of Pennsylvania is an affirmative action/equal opportunity employer. All qualified applicants will receive consideration for employment and will not be discriminated against on the basis of race, color, religion, sex, sexual orientation, gender identity, creed, national or ethnic origin, citizenship status, disability, veteran status, or any other characteristic protected by law.

AEROSPACE ENGINEERING & MECHANICS

SPACE/ASTRONAUTICS FACULTY POSITION

THE DEPARTMENT OF AEROSPACE ENGINEERING & MECHANICS (AEM) AT THE UNIVERSITY OF ALABAMA invites applications for a tenure-track faculty position in areas related to space and astronautics. It is anticipated that the successful candidate will join the faculty at the rank of tenure-track Assistant Professor, although exceptional candidates may be considered for higher rank depending upon experience and qualifications.

With 16 tenured and tenure-track faculty members, the AEM department enrolls 300+ undergraduate students in the ABET-accredited BSAE program and 50+ graduate students in the MS and PhD programs. The AEM Department is currently experiencing an era of unprecedented growth and expansion. The AEM department benefits from the University's rapid expansion in terms of facilities, including the recent construction of the $300 million Shelby Engineering and Science Quad. This four building complex provides over 900,000 square feet of state-of-the-art research and instructional space, the majority of which is devoted to the College of Engineering.

The University of Alabama is located on a beautiful 1,168 acre residential campus in Tuscaloosa, a dynamic and resilient community of over 150,000. The Tuscaloosa community provides rich cultural, educational, and athletic activities for a broad range of lifestyles. With technology-oriented government & industrial research centers (including the U.S. Army's Redstone Arsenal and the NASA Marshall Space Flight Center) in north Alabama and a growing aviation industrial sector (including Airbus aircraft manufacturing & engineering centers) in south Alabama, The University of Alabama is centrally located in Alabama's north-south aerospace corridor.

Applicants must have an earned doctorate degree in aerospace engineering or a closely related field. Applicants are to submit: a letter of application, a detailed CV, and contact information for at least three professional references. The successful applicant will be expected to develop a strong externally-funded research program, demonstrate a commitment to excellence in teaching & mentoring of students, and provide service to the profession, university, college of engineering and AEM department. All application materials must be submitted via The University of Alabama's employment website (https://facultyjobs.ua.edu/postings/37659). Review of applications will begin immediately and will continue until the position is filled. Inquiries should be addressed to Dr. Paul Hubner, Department of Aerospace Engineering & Mechanics, Box 870280, The University of Alabama, Tuscaloosa, AL 35487-0280 or sent by e-mail to phubner@eng.ua.edu.

Qualified women and minorities are encouraged to apply. The University of Alabama is an equal opportunity, affirmative action, Title IX, Section 504, ADA employer. Salary will be competitive and commensurate with experience level.

THE UNIVERSITY OF ALABAMA® | College of Engineering

FACULTY POSITION IN EXPERIMENTAL NAVAL HYDRODYNAMICS

THE UNIVERSITY OF IOWA

The Department of Mechanical and Industrial Engineering (MIE) invites applications and nominations for a tenure-track Assistant Professor position in mechanical engineering in the area of experimental naval hydrodynamics, effective Fall 2016. Candidates for more senior ranks will also be considered. An earned doctorate in mechanical engineering or a related discipline is required. Desirable skills include experience with large, complex facilities, implementing global and local measurements systems for research to advance understanding in basic flow physics and modeling, for use in computational fluid dynamics validation, and including experimental uncertainty analysis. A vision to expand current research programs in naval hydrodynamics to other areas including wave energy conversion, ocean engineering, and other complex fluid, wave, structure interactions would be desirable.

The position is associated with IIHR—Hydroscience & Engineering. IIHR has a distinguished record of water science research spanning over 90 years. IIHR is in the unique position to offer the new faculty world-class facilities to perform experiments in surface and underwater Naval Hydrodynamics, including a 100 m towing tank, a 20x40 m^2 wave basin, flumes and wind tunnels, as well as modern instrumentation to measure motions, forces and flow field, including submersible stereographic PIV, tomographic PIV, two- and three-dimensional LDVs, and other advanced measurement systems. These facilities, unique for a University in the US, are supported by highly qualified research and technical support staff, and will be available to the new faculty member as shared resources.

The Mechanical Engineering Program offers excellent opportunities for multidisciplinary collaboration with various engineering and science departments and research centers. The MIE Department is a home of innovative research and innovative teaching activities. The new faculty will have the opportunity to participate in a new ONR-supported undergraduate STEM education program focusing on naval hydrodynamics. Faculty responsibilities include effective classroom teaching of undergraduate and graduate courses in mechanical engineering, developing curricula and laboratories, supervising M.S. and Ph.D. students, publishing journal articles, and establishing and maintaining an externally funded research program that contributes to the overall goals of the College of Engineering. Effective communication and leadership skills are vital. Teaching experience is desirable. Salary and benefits are excellent. Interested candidates should apply electronically to Requisition #67515 at http://jobs.uiowa.edu/faculty/view/67515 where they will be asked to submit a letter of application with a statement of research and teaching interests, the names and addresses of three references, and current curriculum vitae. Applications will be reviewed starting November 16, 2015; however, they will be accepted until the position is filled. The University of Iowa is an equal opportunity and affirmative action employer. All qualified applicants are encouraged to apply and will receive consideration for employment free from discrimination on the basis of race, creed, color, national origin, age, sex, pregnancy, sexual orientation, gender identity, genetic information, religion, associational preference, status as a qualified individual with a disability, or status as a protected veteran.

AUBURN UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING MULTIPLE TENURE-TRACK FACULTY POSITIONS

The Department of Mechanical Engineering at Auburn University invites applications for multiple tenure-track faculty positions to begin in Spring 2016 or Fall 2016. Candidates with expertise in all areas related to mechanical engineering are invited to apply. Applicants must have a Ph.D. in Mechanical Engineering or a closely related field. Candidates will be considered at the Assistant, Associate, and Full Professor levels. Applicants at the Associate and Full Professor levels must have active nationally or internationally recognized research programs.

The ME Department currently has 35 full-time faculty members and supports strong graduate and undergraduate programs in Mechanical Engineering and Materials Engineering. Enrollments during the Fall Semester 2015 include 740 undergraduate students in major and 170 graduate students. Current departmental areas of research strength include unmanned and robotic systems, electronic packaging and reliability, solid mechanics and advanced materials, electronics cooling and thermal management, tribology, advanced powertrains, and energy systems. The Auburn University College of Engineering has several unique opportunities to enable faculty success including (1) strong connection with the defense industry, (2) local automotive and aerospace companies including production additive manufacturing, (3) a class 10 clean room for electronics manufacturing and packaging, (4) MRI center, (5) automotive test track, and (6) collaborations with faculty in veterinary medicine and a new medical school. Additional information can be found at http://www.eng.auburn.edu/mech/.

Auburn University was chartered in 1856 and was designated a land grant institution in 1872. The Fall 2015 university enrollment is over 27,000 students. Auburn is located 100 miles southwest of Atlanta, has an excellent public school system, and has been nationally ranked as one the "best small towns in America."

The individual selected for this position will be expected to contribute to the growth of the department by developing a strong externally-funded research program, collaborating on interdisciplinary research projects, publishing research results in appropriate scholarly outlets, directing graduate students, teaching undergraduate and graduate courses, and being involved in service to the department and profession. Excellent communication skills and a high level of personal motivation are required.

Applicants should submit a cover letter, current CV, statements of research vision and teaching philosophy, and three references at: http://aufacultypositions.peopleadmin.com/postings/1302. Review of applications will begin on November 1, 2015 and continue until successful candidates have been identified.

The candidate selected for this position must be able to meet eligibility requirements to work in the United States at the time appointment is scheduled to begin and continue working legally for the proposed term of employment.

AU is an EEO/Vet/Disability employer.

THE UNIVERSITY OF TENNESSEE KNOXVILLE
DEPARTMENT OF MECHANICAL, AEROSPACE & BIOMEDICAL ENGINEERING

RICHARD ROSENBERG ENDOWED PROFESSORSHIP IN MECHANICAL ENGINEERING

The Department of Mechanical, Aerospace and Biomedical Engineering (MABE) at the University of Tennessee is seeking an exceptionally qualified candidate with significant expertise in an area of mechanical engineering for the appointment to the position of Professor and holder of the Richard Rosenberg Endowed Professorship. The successful candidate will be an internationally recognized leader in mechanical engineering; a team player; and able to build multi-participant research programs. The successful candidate will also be able to obtain major research sponsorship, and recruit high-quality graduate students. Applications and nominations are invited for this senior position.

The successful candidate will have a doctorate in mechanical engineering, a proven track record of developing research funding, and a substantial and active research program with archival publications in mechanical engineering. Specific interest and experience related to automotive engineering is highly desirable, but not required. Prior academic experience is highly desirable, but not required. Applicants with outstanding industrial research accomplishments are welcomed.

The University of Tennessee, Knoxville, a Carnegie Research I institution, is the state's comprehensive, land grant, research institution. The College of Engineering presently has seven departments with 171 faculty, 2,848 undergraduates and 976 graduate students, and research expenditures of $58.5M per year.

The MABE Department currently has 40 tenured or tenure track faculty as well as 5 lecturers and a Professor of Practice. MABE enrolls some 1,030 undergraduate and 157 graduate students, offering degrees at all levels in mechanical engineering, aerospace engineering and biomedical engineering (http://www.mabe.utk.edu).

The Knoxville and regional areas in general have outstanding opportunities for research collaboration. The University of Tennessee is home to the $259M Institute for Advanced Composite Manufacturing Innovation (IACMI), and will offer major opportunities for research collaboration to the successful candidate. The Oak Ridge National Laboratory (http://www.ornl.gov) is located 25 miles from the campus. The National Transportation Research Center (http://web.ornl.gov/sci/transportation/) and the Manufacturing Demonstration Facility (http://web.ornl.gov/sci/manufacturing/) have extensive opportunities for collaboration in transportation and advanced manufacturing.

Volkswagen is establishing a North American market focused R&D Center at their nearby Chattanooga manufacturing plant. The new R&D Center will be operational this year and will offer unique opportunities for technology innovation with one of the world's largest automotive corporations.

Review of applications and nominations will begin upon receipt, and will continue until the position is filled with the intent to interview in early Spring. Applications should include a concise letter of intent outlining the applicant's research goals and objectives, current curriculum vitae, in addition to the names, addresses, and telephone numbers of four references. Applications and nominations should be sent to (electronic submission is preferred):

Dr. William R. Hamel, Chair
Richard Rosenberg Endowed Professorship in Mechanical Engineering
403 Dougherty Engineering Building
The University of Tennessee, Knoxville, TN 37996-2210
whamel@utk.edu

The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its education and employment programs and services. All qualified applicants will receive equal consideration for employment without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, gender identity, age, physical or mental disability, or covered veteran status.

UNIVERSITY OF Cincinnati

TENURE TRACK FACULTY POSITIONS IN MECHANICAL AND MATERIALS ENGINEERING

THE DEPT. OF MECHANICAL AND MATERIALS ENGINEERING AT THE UNIVERSITY OF CINCINNATI INVITES APPLICATIONS FOR TWO FULL-TIME TENURE-TRACK POSITIONS, one each in the Mechanical Engineering Program and the Materials Science and Engineering Program, starting Jan. 1 or Aug. 15. Applications at the assistant or associate professor level are preferred. A broad and diverse spectrum of candidates is sought; women, members of underrepresented minority groups, and persons with disabilities are strongly encouraged to apply. Information about the department can be found at http://www.eng.uc.edu/dept_min/.

MATERIAL SCIENCE AND ENGINEERING PROGRAM POSITION IN PHYSICAL AND MECHANICAL METALLURGY:

Candidates are sought with research specialties in physical and mechanical metallurgy with emphasis on lightweight alloys, high-temperature alloys and/or additive manufacturing of metals. Qualifications include a doctorate in materials science and engineering or closely related discipline and a record of scholarly achievement. Expertise in microstructural characterization including diffraction and analytical/high-resolution electron microscopy and spectroscopy are desirable.

Contact: Dr. Sam Anand, Chair, Physical and Mechanical Metallurgy Faculty Search Committee
E-mail: Sam.Anand@uc.edu; link to apply: https://goo.gl/th0RYz

MECHANICAL ENGINEERING PROGRAM POSITION IN STRUCTURAL DYNAMICS:

Candidates are sought with research specialties in the areas of structural dynamics, applied system dynamics including sensors, instrumentation and digital signal processing, machinery dynamics, nonlinear system analysis, structural health monitoring, vibro-acoustics, automotive NVH, and related fields. A strong background in both experimental and analytical techniques, and experience in university, industry or a government research laboratory are highly desirable. Qualifications include a doctorate in mechanical engineering or closely related discipline, and proven record of scholarly activities.

Contact: Dr. David Thompson, Chair, Structural Dynamics Faculty Search Committee
E-mail: David.Thompson@uc.edu; link to apply: https://goo.gl/jFQkS0

Successful candidates are expected to develop strong externally-funded research programs, supervise graduate research, publish in archival journals, and teach graduate and undergraduate courses. Submit CV, names and contact information for at least three references, and a cover letter summarizing research plan and teaching interests. Review of applications will begin immediately and continue until positions are filled. The University of Cincinnati is an affirmative action/equal opportunity employer with a strong commitment to the principle of diversity. UC is the recipient of the NSF ADVANCE Institutional Transformation Award to increase the participation of women in academic STEM careers. Additional information is available at www.uc.edu/hr/equal_opportunity.html

UMASS LOWELL

ASSISTANT/ASSOCIATE/FULL PROFESSORS MECHANICAL ENGINEERING

THE DEPARTMENT OF MECHANICAL ENGINEERING AT THE UNIVERSITY OF MASSACHUSETTS LOWELL is seeking to hire several full-time tenure-track faculty at the ranks of Assistant or Associate Professor; applications for Full Professor will also be considered for exceptional candidates. Applicants must have earned Doctoral degrees in mechanical engineering, or closely related disciplines, and are required to have a record of quality teaching and scholarship. Successful applicants will collaborate with existing faculty members, teach classes to support the undergraduate and graduate programs, develop new courses, advise and recruit graduate students, and are expected to develop a robust, externally funded research program in one of the following areas:

(1) ROBOTICS AND AUTONOMOUS SYSTEMS: Networked controlled systems, multi-agent dynamic systems, probabilistic robotics, autonomous vehicles, cyber-physical systems, and motion planning.

(2) COMPOSITE MATERIALS: computational or experimental investigation of composite materials, with special consideration given to candidates focused on (a) modeling of composite manufacturing processes, (b) modeling damage in composites, such as crashworthiness, or (c) structural or multi-functional design with composites and advanced materials.

(3) THERMOFLUID TRANSPORT: (a) computational transport processes including multi-scale, multi-phase, and/or reaction kinetics or (b) experimental/computational full-spectrum solar energy utilization, photo/thermochemical renewable energy conversion and storage.

Note: Candidates must clearly specify a single research area (of the three listed) in bold font in the first sentence of their Cover Letter. In cases of demonstrated outstanding research productivity and scholarship, an appointment with tenure may be considered. To apply, visit: http://jobs.uml.edu. Applications received by December 31, 2015 will be considered in the first review of candidates. However, later applications may be considered for these positions. Each position will close after an adequate number of qualified applications is received. UMass Lowell is a Carnegie Doctoral High Research (RU/H) university ranked in the top tier of US News' National Universities, and is strategically located 30 miles northwest of Boston in the northeast Massachusetts high-tech region. The department has over 900 undergraduate students and over 100 graduate students. An optional co-op program is available to undergraduates. The undergraduate engineering program is based on a design-build-test methodology and is ABET accredited. The University of Massachusetts Lowell is committed to increasing diversity in its faculty, staff, and student populations, as well as curriculum and support programs, while promoting an inclusive environment. We seek candidates who can contribute to that goal and encourage candidates to apply and to identify their strengths in these areas.

The University of Massachusetts Lowell is an Equal Opportunity/Affirmative Action, Title IX employer.

SAN DIEGO STATE UNIVERSITY

FACULTY POSITION DEPARTMENT OF MECHANICAL ENGINEERING

The Department of Mechanical Engineering seeks to fill a tenure-track position at the Assistant Professor level in the area of mobile energy (energy storage as applied to automotive industry) starting Fall 2016. San Diego State University (SDSU), Department of Mechanical Engineering shares with the College of Engineering and the University a strong commitment to excellence in undergraduate and graduate education.

Applicants must hold an earned Ph.D. in Mechanical Engineering or closely related discipline and have a demonstrated ability to teach thermodynamics, heat transfer, fluid mechanics, and related classes. The successful candidate is expected to have demonstrated potential for developing an externally funded research program in the general area of mobile energy storage (batteries, fuel cells, ultra-capacitors, etc.). He or she is also expected to supervise teams of undergraduate as well as graduate students in our M.S. and Ph.D. programs. For more information visit: http://www.sdsu.edu, http://engineering.sdsu.edu, and http://mechanical.sdsu.edu.

Mechanical Engineering is one of the four departments in the College of Engineering at San Diego State University with an EAC, ABET-accredited B.S. degree program in Mechanical Engineering, as well as M.S. and Ph.D. programs involving students in leading edge research. The College of Engineering is an integral part of NSF's Engineering Research Center for Sensorimotor Neural Engineering. San Diego offers a beautiful coastal climate typical of Southern California, with close proximity to mountains.

SDSU is a large, diverse, urban university and Hispanic-Serving Institution with a commitment to diversity, equity, and inclusive excellence. Our campus community is diverse in many ways, including race, religion, color, sex, age, disability, marital status, sexual orientation, gender identity and expression, national origin, pregnancy, medical condition, and covered veteran status. We strive to build and sustain a welcoming environment for all. SDSU is seeking applicants with demonstrated experience in and/or commitment to teaching and working effectively with individuals from diverse backgrounds and members of underrepresented groups. Review of applications will begin in December 2015 and will continue until the position is filled. Nominations are accepted, and candidates must apply via Interfolio at http://apply.interfolio.com/31528. Applicants should submit curriculum vitae, statement of research and teaching interests, three representative publications, and complete contact information for three references.

The person holding this position is considered a "mandated reporter" under the California Child Abuse and Neglect Reporting Act and is required to comply with the requirements set forth in CSU Executive Order 1083 as a condition of employment.

A background check (including a criminal records check) must be completed satisfactorily before any candidate can be offered a position with the CSU. Failure to satisfactorily complete the background check may affect the application status of applicants or continued employment of current CSU employees who apply for the position.

SDSU is a Title IX, equal opportunity employer and does not discriminate against persons on the basis of race, religion, national origin, sexual orientation, gender, gender identity and expression, marital status, age, disability, pregnancy, medical condition, or covered veteran status.

Tenure-Track Faculty Positions in Mechanical Engineering

THE UNIVERSITY OF TOLEDO 1872

The Department of Mechanical, Industrial and Manufacturing Engineering at The University of Toledo is seeking outstanding candidates for multiple tenured or tenure-track faculty positions at the Assistant or Associate Professor levels. Candidates with strong qualifications in any area of mechanical engineering will be considered, but preference will be given to candidates with research expertise in experimental thermal/fluids, mechanical design, and materials.

The department currently has 18 tenure-track or tenured faculty members and an enrollment of more than 800 undergraduate students and 90 graduate students pursuing B.S., M.S. and Ph.D. degrees. The faculty conduct funded research in excess of $4M per year across a broad range of areas. The department has a large number of experimental and computational facilities including a well instrumented subsonic wind tunnel, a small turbine engine laboratory, and flow visualization facilities. There has been a long history of collaboration with the regional automotive, energy, and glass related industries, as well as the NASA Glenn Research Center. More information about the department can be found at: http://eng.utoledo.edu/mime.

All successful candidates are expected to contribute to and play a leadership role in advancing research and teaching in their respective areas of expertise and to contribute to the diversity of the University's academic community. The University of Toledo is a comprehensive public metropolitan research university established in 1872. In addition to the College of Engineering, other professional colleges include Business Administration, Law, Medicine, Natural Sciences and Mathematics, and Pharmacy providing abundant opportunities for collaborative education and research within the University.

Applicants must have an earned doctoral degree in mechanical engineering or a related field and are expected to teach undergraduate and graduate level courses in their fields of expertise, supervise graduate student research, and develop and grow a strong, externally funded research program. Interested applicants should submit a detailed curriculum vitae, statements of research and teaching interests, and names and contact information of at least four professional references. All applicants for this position are required to complete the application online at The University of Toledo's web site: **https://jobs.utoledo.edu** and submit all supporting application materials, prepared in PDF format, online. Review of applications will begin December 2015 and will continue until the positions are filled.

The University of Toledo is an equal access, equal opportunity, affirmative action employer and educator

THE UNIVERSITY OF UTAH

FACULTY POSITIONS IN MECHANICAL ENGINEERING

The Department of Mechanical Engineering at the University of Utah (http://www.mech.utah.edu/) invites applications for **five tenure track positions at the assistant or associate rank** with a Fall Semester 2016 starting date. Candidates with exceptional background and experience may be considered at a higher rank. Candidates with interest and expertise in the areas of **i) solid mechanics -- 2 positions, ii) design and/or manufacturing, iii) thermal sciences, fluid mechanics, or energy systems, and iv) robotics** are strongly encouraged to apply. Candidates should be qualified to teach courses in the core curriculum of a mechanical engineering program, including existing courses and/or developing new courses that support their graduate program. Candidates are expected to develop and maintain an active, externally funded research program that complements existing research programs. Collaborations in the Department, College of Engineering, School of Medicine, and elsewhere across campus are highly encouraged. Rank and salary will be commensurate with qualifications and experience. Applicants are expected to have an earned Ph.D. or Sc.D. in Mechanical Engineering or a closely related field. The Department of Mechanical Engineering currently has 33 tenure-line faculty members, over 950 undergraduate and 200 graduate students. With funding from the state's Engineering Initiative, the Department expects to hire up to 14 additional faculty members over the next three years. The University of Utah is a tier 1 research institution that has ranked in the top 5 nationally for start-up companies in the last 5 years. The University of Utah campus is situated in Salt Lake City, a diverse, cosmopolitan city with a population of 1M nestled against the backdrop of the beautiful Wasatch Mountains. Salt Lake City residents have unparalleled access to national parks (8 within a few hours drive), skiing/snowboarding (7 resorts within 30 minutes), hiking, fishing, biking, rafting/kayaking, NBA basketball, MLS soccer, and numerous cultural events including opera, dance, symphony, theatre, and outdoor concerts, amongst others. In addition, faculty members enjoy the convenience of an international airport located only 15 minutes from campus. Review of applications will begin on December 1, 2015 and continue until positions are filled. Applications must be submitted electronically and should include a cover letter highlighting the applicant's qualifications, current curriculum vitae, statements of research and teaching interests and teaching philosophy, and contact information for a minimum of three references. All documents must be uploaded at the specified link. Please check the complete position announcements at http://mech.utah.edu/department/open-positions/. For application submission questions, please contact department manager Sheila Olson (Sheila.Olson@utah.edu) at the Department of Mechanical Engineering, 50 Central Campus Dr., Salt Lake City, UT 84112.

The University of Utah is an Equal Opportunity/Affirmative Action employer and educator. Minorities, women, veterans, and persons with disabilities are strongly encouraged to apply. Veterans' preference is extended to qualified veterans. Reasonable disability accommodations will be provided with reasonable notice. For additional information about the University's commitment to equal opportunity and access see: http://www.utah.edu/nondiscrimination/.

THE UNIVERSITY OF IOWA

FACULTY POSITION IN ROBOTICS AND AUTONOMOUS SYSTEMS

The Department of Mechanical and Industrial Engineering (MIE) invites applications and nominations for a tenure-track Assistant Professor position in mechanical engineering in the area of robotics and autonomous systems effective Fall 2016. Candidates for more senior ranks will also be considered. An earned doctorate in mechanical engineering or a related discipline is required. Candidates with backgrounds in autonomous vehicles, autonomous robotic systems, sensor-based robotics, medical robotics, manufacturing automation, unmanned aerial vehicles, multi-agent systems, and other emerging application areas are especially encouraged to apply.

The Mechanical and Industrial Programs offer excellent opportunities for multidisciplinary collaboration at research centers with established global reputations, such as the Center for Computer-Aided Design and IIHR-Hydroscience and Engineering, as well as world-renowned research and teaching hospital the University of Iowa Hospitals & Clinics (UIHC).

The MIE Department is a home of innovative research and innovative teaching activities. Faculty responsibilities include effective classroom teaching of undergraduate and graduate courses in mechanical engineering, developing curricula and laboratories, supervising M.S. and Ph.D. students, publishing journal articles, and establishing and maintaining an externally funded research program that contributes to the overall goals of the College of Engineering. Effective communication and leadership skills are vital. Teaching experience is desirable. Salary and benefits are excellent. Interested candidates should apply electronically to Requisition #67517 at http://jobs.uiowa.edu/faculty/view/67517 where they will be asked to submit a letter of application with a statement of research and teaching interests, the names and addresses of three references, and current curriculum vitae. Applications will be reviewed starting November 16, 2015; however, they will be accepted until the position is filled. The University of Iowa is an equal opportunity and affirmative action employer. All qualified applicants are encouraged to apply and will receive consideration for employment free from discrimination on the basis of race, creed, color, national origin, age, sex, pregnancy, sexual orientation, gender identity, genetic information, religion, associational preference, status as a qualified individual with a disability, or status as a protected veteran.

University of Illinois at Chicago

Assistant/Associate/Full Professor

Mechanical and Industrial Engineering

The Department of Mechanical and Industrial Engineering at the University of Illinois at Chicago (UIC) invites applications for a tenured position in the area of advanced energy storage systems in Mechanical Engineering and Industrial Engineering. The department is looking to strengthen its thrust area in advanced energy storage systems. We are looking for candidates with expertise in energy storage systems in the areas of predictive modeling, designing novel systems, and advanced manufacturing.

The ideal candidate should meet the requirements for an appointment as an associate or full professor with tenure. Candidates at the assistant professor rank will also be considered. Successful applicants are required to have earned a PhD in Mechanical or Industrial Engineering or a related field, and are expected to have developed and maintained active externally-funded research programs. Candidates should also have demonstrated success in leading and obtaining interdisciplinary collaborative research grants, preferably, in advanced energy storage systems or related areas. They should also have expertise in teaching courses at both the undergraduate and graduate levels.

The Department offers BS, MS, and PhD degrees in Mechanical Engineering, Industrial Engineering and Operations Research, and currently has 32 faculty, an undergraduate enrollment of about 700 and a graduate enrollment of about 300. More information about the Department can be found at http://www.mie.uic.edu. Applicants are required to send a letter of application indicating their qualifications, an up-to-date CV including the names and contact information of five references, and separate one-page statements outlining their future teaching and research plans.
For fullest consideration, applications must be submitted online at **https://jobs.uic.edu/job-board/job-details?jobID=55192** by **January 4, 2016**. Applications will be accepted until the position is filled. The expected starting date is August 2016.

MECHANICAL AND INDUSTRIAL ENGINEERING COLLEGE OF ENGINEERING

UIC is an EOE/AA/M/F/Disabled/Veteran

THE UNIVERSITY OF MAINE

TENURE-TRACK ASSISTANT PROFESSOR: THERMAL FLUID SCIENCES

The Department of Mechanical Engineering at the University of Maine seeks applicants for a tenure-track faculty position at the assistant professor level in the thermo-fluid sciences and/or heat transfer areas. The successful applicant for this position is expected to demonstrate exceptional strength in research, teaching, and service. The department offers B.S., M.S. and Ph.D. degrees in Mechanical Engineering, and has a long history of excellence in the undergraduate and graduate programs. Related areas of research in the department are the following: heat transfer, computational and experimental fluid mechanics, aerodynamics, energy, ocean engineering, biomedical engineering, and computational and experimental geophysics. The position requires B.S. and Ph.D. degrees in mechanical engineering, or a closely related discipline. The successful candidate is expected to demonstrate a strong commitment to teaching, and the ability to develop an externally funded research program. Further inquiries about this position may be sent to mee.facultysearch@maine.edu. Applications, including a cover letter, a full curriculum vitae, statements of research and teaching interests, and contact information for several potential references should be sent to the Department of Human Resources via https://umaine.hiretouch.com. Review of applications will begin Jan. 04, 2016. The expected start date is September 2016.

Salary and benefits are competitive and dependent on qualifications. Ph.D. is required at time of appointment.

The University of Maine is an EEO/AA employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, sexual orientation, age, disability, protected veteran status, or any other characteristic protected by law.

TENURE-TRACK FACULTY POSITION IN MECHANICAL ENGINEERING – FLUID MECHANICS OR THERMAL SCIENCES

Washington University in St.Louis

Washington University in St. Louis invites applications for a tenure-track faculty position in mechanical engineering with research focus in fluid mechanics or the thermal sciences, to begin on or after July 1, 2016. Candidates should have an earned Ph.D. in mechanical engineering, aerospace engineering, or a closely-related discipline. Areas of particular interest include energy conversion, storage, transport and efficiency as well as theoretical, computational and applied fluid mechanics.

The successful applicant will have a primary appointment in Mechanical Engineering & Materials Science (mems.wustl.edu) with the possibility of joint appointments in other departments. The faculty member will be expected to teach undergraduate and graduate courses in mechanical engineering, participate in University service, and establish a vigorous externally-funded research program. The open position is at the rank of Assistant Professor; appointment at a more senior rank will be considered for an exceptional candidate with a distinguished record of achievement in research and teaching.

Applicants should apply online with (1) a curriculum vitae, (2) a statement of research plans, (3) a statement of teaching interests and philosophy, and (4) a list of at least three references to https://academicjobsonline.org/ajo/jobs/6186. Applications will be accepted at any time, and will be considered until the position is filled; evaluation will begin by November 15, 2015. Women and members of groups under-represented in engineering are encouraged to apply.

Washington University is an equal opportunity/affirmative action employer. Verification of employment eligibility will be required upon employment.

WESTERN NEW ENGLAND UNIVERSITY WNE

The Department of Mechanical Engineering at Western New England University seeks applications for a tenure track Assistant Professor position, beginning in August 2016. Candidates for this position must have a Ph.D. in Mechanical Engineering or a closely related field, and must have the potential for or demonstrated excellence in teaching at both undergraduate and graduate levels, and potential for successful research, innovation and scholarly activities. Candidates with an interest and expertise in the areas of Mechatronics, Measurement and Control are sought. The successful candidate is expected to teach undergraduate and graduate level courses in the stated areas as well as fundamental engineering courses; pursue scholarly and research activities; and support our innovative freshman engineering program. Industrial experience and professional engineering licensure is preferred.

Western New England University has a vibrant undergraduate mechanical engineering program that emphasizes industrially relevant research and design, as well as an active Master of Science program. The program prides itself on delivering high-quality engineering education while providing strong mentorship to students. The ME department maintains strong relationships with regional and national industries and corporations.

Western New England University is a private, independent, coeducational institution founded in 1919. Located on an attractive 215-acre suburban campus in Springfield, Massachusetts, Western New England University serves 3,700 students, including 2,550 full-time undergraduate students. Undergraduate, graduate and professional programs are offered through Colleges of Arts and Sciences, Business, Engineering, and Pharmacy and School of Law. For more information about the University, visit our website at http://www.wne.edu.

Screening of applications will begin October 19, 2015 and will continue until the position is filled. Applicants are requested to submit a single PDF file with cover letter, detailed curriculum vita, statement of teaching and research interests, and the names and contact information of at least three references to: Chair, ME Search Committee, Attn: Sharon Smith, College of Engineering, Western New England University, 1215 Wilbraham Road, Springfield, MA 01119. Electronic submissions should be sent to sharon.smith@wne.edu.

Western New England University is an Equal Opportunity Employer. We welcome candidates whose background may contribute to the further diversification of our community.

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Faculty Position in Mechanical Engineering

at Ecole polytechnique fédérale de Lausanne (EPFL)

The Institute of Mechanical Engineering is soliciting applications for a faculty position at the level of **tenure-track assistant professor or (tenured) associate professor** in any discipline in the field of mechanical engineering.

Of particular interest for this search are applicants who perform experimental research. Areas of specific technical interest include but not limited to new energy conversion and storage technologies, thermodynamics, advanced manufacturing, applied solid mechanics, metamaterials, and heat/mass transfer. Applicants should have a demonstrated record of excellence in their chosen technical area.

As a faculty member of the School of Engineering, the successful candidate will be expected to initiate an independent and creative research program and participate in undergraduate and graduate teaching. Internationally competitive salaries, start-up resources and benefits are offered.

EPFL, with its main campus located in Lausanne, Switzerland, is a dynamically growing and well-funded institution fostering excellence and diversity. As a technical university covering essentially the entire palette of engineering and science, EPFL offers a fertile environment for research cooperation between different disciplines. EPFL has a highly international environment that is multi-lingual and multi-cultural, with English often serving as a common interface.

Applications should include a cover letter with a statement of motivation, curriculum vitae, list of publications and patents, concise statement of research and teaching interests. Applicants for assistant professor should request five letters of recommendation to be uploaded to the recruitment web site, while applicants for associate professor should provide the names and addresses of at least five potential recommenders. Applications must be uploaded in PDF format to the recruitment web site:

http://go.epfl.ch/igm-search

Formal evaluation of candidates will begin on **4 January 2016**.

Enquiries may be addressed to:
Prof. John Botsis
Search Committee Chair
e-mail: igm-search@epfl.ch

For additional information on EPFL, please consult the web sites: **www.epfl.ch, sti.epfl.ch** and **igm.epfl.ch**.

EPFL is committed to increasing the diversity of its faculty, and strongly encourages women to apply.

UNIVERSITY OF MICHIGAN-SHANGHAI JIAO TONG UNIVERSITY JOINT INSTITUTE. The University of Michigan and Shanghai Jiao Tong University have established a Joint Institute in Shanghai committed to building a world-class research and educational institution based on the US university model. English is the official language. The students are among China's best. The UM-SJTU Joint Institute invites applications for tenure-track and tenured positions at assistant, associate or full professor in all emerging fields related to Mechanical Engineering, Electrical and Computer Engineering, Material Science and Engineering. Successful candidates are expected to establish vigorous research programs, mentor Ph.D. students, participate in the international research community, and teach undergraduate and graduate classes. Salary will be highly competitive and commensurate with qualifications. Applicants should send a CV, statement of research interests, three publications, and contact information for five referees as a single PDF file to: Prof. Chien-Pin Chen, Head of the Search Committee, chienpin.chen@sjtu.edu.cn . http://umji.sjtu.edu.cn/en/.

FACULTY POSITIONS IN MECHANICAL ENGINEERING MASSACHUSETTS INSTITUTE OF TECHNOLOGY CAMBRIDGE, MA. The Massachusetts Institute of Technology (MIT) Department of Mechanical Engineering seeks candidates for **FACULTY POSITIONS** starting in September 2016 or thereafter. Appointment will be at the assistant or untenured associate professor level. In special cases, a senior faculty appointment will be considered. We seek candidates who will provide inspiration and leadership in research, contribute proactively to both undergraduate and graduate level teaching in the Mechanical Engineering department and add to the diversity of the academic community.

Faculty duties include teaching at the graduate and undergraduate levels, advising students and conducting research. Candidates must hold an earned Ph.D. in Mechanical Engineering or a related field by the beginning of employment. Candidates in all areas related to Mechanical Engineering will be considered, including, but not limited to: (1) mechanics: modeling, experimentation and computation, (2) design, manufacturing, and product development, (3) control, instrumentation, and robotics, (4) energy science and engineering, (5) ocean science and engineering, (6) bioengineering, and (7) micro/nanoengineering. Our department is committed to fostering interdisciplinary research that can address grand challenges facing our society.

Applicants should send a curriculum vitae, a research statement, a teaching statement, and copies of no more than three publications. They should also arrange for four individuals to submit letters of recommendation on their behalf. This information must be entered electronically at the following site: https://school-of-engineering-faculty-search.mit.edu/meche/register.tcl by December 1, 2015 when review of applications will begin.

MIT is an equal-opportunity/affirmative action employer. Women and underrepresented minorities are especially encouraged to apply.

CALIFORNIA STATE UNIVERSITY, CHICO

College of Engineering, Computer Science, and Construction Management invites applications for a full-time, tenure-track faculty position in Mechanical Engineering at the Assistant or Associate Professor level to start August 2016. This position requires a strong commitment to undergraduate teaching. The full position announcement, including qualifications, application requirements, and additional information about the department is available at www.csuchico.edu/mmem/faculty_positions.shtml.

CALIFORNIA STATE UNIVERSITY, LOS ANGELES The department of Mechanical Engineering at the California State University, Los Angeles, invites applications for a full-time tenure-track Assistant Professor/Associate Professor positions in Mechanical Engineering. The positions are in Modeling and Design of Mechanical Systems with any single or combination of three areas of specialization: Fluid and Thermal Sciences, Finite Element Analysis, or Dynamics and Kinematics. Applicants must have an earned doctorate degree in Mechanical Engineering or closely related field by the start date of their appointment. The successful candidate has a strong primary commitment to excellence in teaching at the undergraduate level, but is also committed to graduate courses and research. Review of applications will begin on October 1, 2015, and continue until the position is filled. The complete position announcement is available at http://web.calstatela.edu/academic/position/csla_cecst.php.

WHEATON COLLEGE (IL) ASSISTANT PROFESSOR IN ENGINEERING. Applications sought for a tenure-track opening beginning Fall 2016. Ph.D. in engineering required. Industry experience strongly preferred. Candidates must be enthusiastic to actively engage and mentor undergraduates in teaching and research from an evangelical Christian perspective. For more information, visit www.wheaton.edu/engineering or contact Dr. Darren Craig (darren.craig@wheaton.edu). Review of applications begins November 1.

ASSISTANT PROFESSOR – THREE POSITIONS (9-MONTH, TENURE-TRACK, START DATE NEGOTIABLE, NOT LATER THAN AUG. 22, 2016). DEPARTMENT OF MECHANICAL ENGINEERING, SOUTH DAKOTA STATE UNIVERSITY. Teaching and research expertise in one or more of the following fields is required: (1) machine design/solid mechanics, (2) dynamic systems/controls/robotics (3) materials testing/advanced manufacturing. For a full list of qualifications and application process, visit https://yourfuture.sdbor.edu. Positions are open until filled with full consideration given to applications received by December 1, 2015. For questions on the electronic employment process, contact SDSU Human Resources at (605) 688-4128. SDSU is an AA/EEO employer.

THE MECHANICAL ENGINEERING PROGRAM AT YORK COLLEGE OF PENNSYLVANIA invites applications for a **TENURE-TRACK, ASSISTANT PROFESSOR POSITION** beginning in the summer semester of 2016 (May 2016), with ongoing teaching assignments in the spring and summer semesters only. Applicants must have a Ph.D. in Mechanical Engineering or a closely related field and have a record of successful undergraduate teaching.

Successful candidates will have the ability to teach in the areas of design, mechanics, mechanical analysis and materials. Preference will be given to candidates who have the ability to teach across a broad range of mechanical engineering courses and who have industrial work experience. Candidates are expected to demonstrate the potential for: outstanding teaching/advising, ongoing college service, and professional development.

York College of Pennsylvania, http://www.ycp.edu, is a private-sector, independent institution of higher education, offering over 50 baccalaureate majors in the arts and sciences and in professional fields as well as master's programs in business, education and nursing and a doctoral program in nursing. The College has an enrollment of over 4000 full time, over 500 part time undergraduate students and over 200 graduate students from 30 states and 12 foreign countries. The campus is located in South-Central Pennsylvania (50 miles north of Baltimore, MD, 30 miles south of Harrisburg, and 90 miles north of Washington, D.C.) and offers competitive salaries and fringe benefits.

York College is committed to building a diverse college community and encourages members of underrepresented groups to apply. Interested candidates should electronically submit the following: a cover letter with a description of relevant experience, a resume, a statement of teaching philosophy and of research philosophy, and names of at least three references to Professor Steve Kuchnicki, Mechanical Engineering Search Chair via email at employment@ycp.edu. Review of applications will begin on October 15, 2015. While applications will be accepted until the position is filled, for full consideration, applications should be received by December 1, 2015.

York College of Pennsylvania is an Equal Opportunity Employer. For a copy of York College's Annual Security Report, you may contact the Office of Campus Safety or visit the website: Annual Security Report.

ENGINEERING SYSTEMS FOR AGRICULTURE THE SCHOOL OF ENGINEERING AT THE UNIVERSITY OF CALIFORNIA MERCED invites applications for a **TENURE OR TENURE-TRACK FACULTY POSITION** in Mechanical Engineering. Assistant, Associate or Full Professor in Engineering Systems for Agriculture: Candidates with proven expertise in Engineering Systems for Agriculture in relation to energy, water, and agricultural automation are invited to apply. Specific areas of interest include but are not limited to: energy systems, biomass fuel processing, thermal conversion, food processing, food security, system design, automation and controls, water-energy technologies, agricultural drainage mitigation technologies. For more information or to apply, visit https://aprecruit.ucmerced.edu/apply/JPF00240

GEORGIA SOUTHERN UNIVERSITY'S DEPARTMENTS OF MECHANICAL ENGINEERING AND OF MANUFACTURING ENGINEERING invite applications for one **TENURE TRACK ASSISTANT PROFESSOR POSITION IN MECHANICAL ENGINEERING** (in the areas of Automotive, Vehicle, and/or Machine Design and Simulation) and three tenure track assistant professor positions in Manufacturing Engineering (Additive Manufacturing, Materials Science and Processing, Safety and Quality Control, Robotics, Assembly and Automation and/or Design for Manufacturing). The positions require strong abilities in the areas of teaching, research, and service, as well as a terminal degree in a related field. The full text advertisements, including information about the department, faculty, and the complete position announcements with all qualifications and application instructions, is available at http://academics.georgiasouthern.edu/positions/. Screening of applications begins 19 November 2015, and continues until the positions are filled. The Department of Manufacturing Engineering also invites applicants for the position of Founding Department Chair of Manufacturing Engineering. The full text advertisement, including information about the department, faculty, and the complete position announcements with all qualifications and application instructions, is available at http://academics.georgiasouthern.edu/positions/. Screening of applications begins 05 October 2015, and continues until the position is filled. Georgia is an open records state. Georgia Southern is an AA/EO institution. Individuals who need reasonable accommodations under the ADA to participate in the search process should contact the Associate Provost.

THE DEPARTMENT OF MECHANICAL ENGINEERING (ME), UNIVERSITY OF MICHIGAN (U-M), ANN ARBOR, seeks outstanding scholars to apply for multiple **FULL-TIME TENURED OR TENURE-TRACK FACULTY POSITIONS.** The positions are open to candidates of all ranks, including junior and senior-level appointments. All who have strong backgrounds in disciplines relevant to mechanical engineering are welcome to apply. Some areas of interests include: computational combustion/thermal/fluids, dynamics & dynamical systems, metals processing/manufacturing, and solid mechanics & materials. We are especially interested in individuals who can contribute to the

LEHIGH UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING & MECHANICS

Lehigh University is accepting applications for a faculty position at the Assistant or Associate Professor level in the field of Solid Mechanics, with an emphasis on structural failure and the mechanics of fracture. The ideal candidate will have a doctoral degree in Mechanical Engineering, or a related field, with a strong background in experimental or theoretical/computational aspects in one or more of areas of solid mechanics, and will be expected to develop a vigorous research program, accompanied by excellence in teaching at both the graduate and undergraduate levels. Multidisciplinary research programs are an important priority at Lehigh University, and include strong interactions with government agencies, industry, and existing research centers on campus. Candidates should provide curriculum vitae that include: a statement of professional experience and goals; detailed plans for research and funding; a list of refereed publications and presentations; a summary of teaching experience and plans; and the names and contact information of four references. This material should be submitted electronically using our online application found at https:// academicjobsonline.org/ajo/jobs/6219. For questions regarding this position, please contact Barbara McGuire, bcm208@lehigh.edu. Review of applications will begin upon receipt and will continue until the position is filled.

Lehigh University is an affirmative action/equal opportunity employer and does not discriminate on the basis of age, color, disability, gender, gender identity, genetic information, marital status, national or ethnic origin, race, religion, sexual orientation, or veteran status. Lehigh University provides comprehensive benefits including partner benefits.

Lehigh is an NSF ADVANCE Institution: http://www.lehigh.edu/luadvance/ Lehigh offers excellent benefits including domestic partner benefit: http://www.lehigh.edu/~inprv/faculty/worklife-balance.html

Lehigh Valley Inter-regional Networking & Connecting (LINC) is a network of diverse organizations designed to assist new hires with dual career, community and cultural transition needs: infdcap@lehigh.edu

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

FACULTY POSITION IN ROBOTICS

The Department of Mechanical and Aerospace Engineering at The Ohio State University invites applications from outstanding individuals for a tenure track faculty position with primary focus on Robotics and Automation. The anticipated start date is August 2016, but the search will continue until the position is filled.

This search will consider faculty candidates having interest and expertise to develop a strong research program in a promising area or areas of robotics, including, but not limited to, (a) bio-inspired design with novel mechanisms and materials; (b) robot perception and sensing; and (c) human-robot interaction; and (d) control, planning, and integration. Possible support application areas include manufacturing automation, reconfigurable manufacturing systems, healthcare and medical robots, service robots, soft robots, and micro robots. The Ohio State University as well as its affiliated community and industries offers a unique opportunity to succeed in this research area. Whereas candidates are primarily sought at the assistant professor level, exceptionally qualified applicants at the associate professor level may be considered.

Qualifications: An earned doctorate in mechanical engineering or an appropriate related field is required. We seek candidates who have demonstrated the ability to conduct research at the highest level, and have a record of, or the promise for, outstanding teaching and supervision of students. The successful candidate will be expected to attract funding to develop and sustain active sponsored research programs, teach core undergraduate and/or graduate courses, and develop new graduate courses related to their research expertise. Screening of applicants will begin immediately and continue until the position is filled. Interested candidates should submit complete curriculum vitae, separate 2-3 page statements of research and teaching goals, and the names and postal/email addresses of four references as a single PDF file via email at mae-robotsearch@osu.edu.

The Ohio State University is an affirmative/equal opportunity employer. Women, minorities, and people with disabilities are encouraged to apply and build a diverse workplace. Columbus is a thriving metropolitan community, and the University is responsive to the needs of dual career couples.

TEXAS TECH UNIVERSITY

EDWARD E. WHITACRE JR. COLLEGE OF ENGINEERING INDUSTRIAL ENGINEERING DEPARTMENT

Assistant/Associate/Full Professor of Industrial Engineering

Applications are invited for multiple tenured/tenure-track faculty positions at all ranks in the Department of Industrial Engineering (IE) within the Whitacre College of Engineering (COE), Texas Tech University (TTU), Lubbock, TX. Exceptional candidates may also be considered for endowed positions.

Successful candidates must possess a Ph.D. in IE or closely related field, be eligible to work in the United States, and have excellent communication skills. Candidates should also demonstrate abilities in high quality research for competitive funding, teaching both undergraduate and graduate courses (including distance education), advising PhD students, and providing appropriate service to the department, university and the profession. While the department is seeking applicants in all areas of IE, the particular interests will be given to manufacturing and systems engineering.

Interested applicants should submit a curriculum vitae (CV), cover letter, one page statement of research interests, one page statement of teaching interests, and the names and contact information (email address or phone number) for at least three professional references online at: http://www.depts.ttu.edu/hr/. Search Postings for Requisitions No. 5275BR and No. 5276BR. Applicants must complete both requisitions in order to be considered for employment. Review of applications will begin immediately and continued until the positions are filled.

As an Equal Employment Opportunity/Affirmative Action employer, Texas Tech University is dedicated to the goal of building a culturally diverse faculty committed to teaching and working in a multicultural environment. We actively encourage applications from all those who can contribute, through their research, teaching, and/or service, to the diversity and excellence of the academic community at Texas Tech University. The university welcomes applications from minorities, women, veterans, persons with disabilities, and dual-career couples.

POSITIONSOPEN

excellence and diversity of the academic community. Underrepresented minority and women candidates are strongly encouraged to apply.

The University of Michigan Mechanical Engineering Department is the home of 63 tenured/tenure-track faculty, 24 research faculty, over 400 graduate students (around 250 Ph.D. students) and 700 undergraduate students. The U-M ME is well known for its outstanding strengths in major mechanical engineering core disciplines as well as in interdisciplinary and emerging thematic areas. The Department is consistently ranked among the top nationwide and worldwide by various ranking systems, such as the QS World rankings, the US News and World Report, and the National Research Council Ph.D. Program evaluation. More information about the Department can be found at: http://me.engin.umich.edu/.

The University of Michigan has a long and distinguished history. It was founded in 1817, 20 years before the territory became a state, and was one of the first public universities in the nation. Throughout its nearly 200-year history, it has maintained the highest levels of education, scholarship, and research. Ann Arbor is a very attractive city, regularly ranked as one of the best places to live in the nation.

Applicants should have an earned Ph.D. in mechanical engineering or a related field. We seek strong scholars who will provide inspiration, leadership and impact in research, teaching and service. For best consideration, candidates are encouraged to apply now and certainly before November 30, 2015 as applications will be reviewed immediately upon receipt. All applicants should submit, in PDF format (1) a detailed resume, (2) a statement of research and teaching interests, (3) up to three representative publications, and (4) the names and contact information of at least three referees. Applications must be submitted electronically at http://me.engin.umich.edu/facultysearch. The University of Michigan is a non-discriminatory/affirmative action employer and is responsive to the needs of dual career families.

KANSAS STATE UNIVERSITY | Mechanical and Nuclear Engineering

FULL-TIME INSTRUCTOR POSITION

The Mechanical and Nuclear Engineering Department at Kansas State University is seeking outstanding applicants for an instructor position to teach undergraduate courses and assist with student advising. Qualifications include a M.S. degree in mechanical or nuclear engineering or related field with substantial industry experience, a strong interest in teaching, and excellent communication skills. Preference will be given to candidates with demonstrated teaching excellence, a Ph.D. in mechanical or nuclear engineering, or extensive industrial experience and leadership. The College of Engineering is undergoing rapid expansion and will be hiring 35 additional faculty members over the next five years.

The department has 27 faculty members and a total of approximately 950 undergraduate and graduate students. More information may be found at http://www.mne.ksu.edu. The College of Engineering is located on the main Kansas State campus in Manhattan, KS. Manhattan is a vibrant family oriented city in the scenic Flint Hills. It is the cultural and business hub of a tri-county area community of over 200,000 residents (see www.manhattan.org).

Applicants should email a single electronic pdf file to mnebiz@ksu.edu that includes a letter of application, resume, one-page statement of teaching philosophy, and contact information for five professional references. Review of applications will begin November 1, 2015 and continue until the position is filled.

Kansas State University is an Equal Opportunity Employer of individuals with disabilities and protected veterans, and actively seeks diversity among its employees. Background check required.

VANDERBILT
School of Engineering

FACULTY POSITION MECHANICAL ENGINEERING DEPARTMENT

The Department of Mechanical Engineering at Vanderbilt University invites applications for a tenure-track faculty position at the rank of Assistant Professor to begin in the fall of 2016. We are particularly seeking outstanding candidates in the area of nanomaterials, for solving critical energy issues, as part of the Vanderbilt School of Engineering's strategic growth initiative in Energy and Natural Resources. We strive for an active, culturally and academically diverse faculty of the highest caliber, skilled in both scholarship and teaching. The Department of Mechanical Engineering has 15 tenured/tenure-track faculty members with strong reputations in research fields including nanoengineering, rehabilitation engineering, and medical robots, with an annual research expenditure of $6.7 million. The successful candidate is expected to make significant contributions to the Department's research and teaching activities. Applications consisting of a cover letter, a complete curriculum vitae, statements of teaching and research interests, and the addresses of at least three references (include email address) should be submitted on-line at https://academicjobsonline.org/ajo/jobs/6048

Ranked in the top 20 nationally, Vanderbilt is a private, internationally renowned research university located in vibrant Nashville, Tennessee. The School of Engineering over the past decade has been on a strong upward trajectory in its national and international stature and prominence, and is entering a period of growth in terms of faculty and facilities. In the 2015 rankings of graduate engineering programs by U.S. News & World Report, the School ranks in the top three among programs with fewer than 100 faculty members.

Vanderbilt University is an Affirmative Action/Equal Opportunity Employer committed to increasing the cultural and intellectual diversity of its faculty. The university aspires to become a leader among its peer institutions in making meaningful and lasting progress in responding to the needs and concerns of women and members of under-represented minority groups.

UNITED STATES AIR FORCE ACADEMY

ASSISTANT PROFESSOR OF ENGINEERING MECHANICS (#16-10DFEM)

The Department of Engineering Mechanics at the United States Air Force Academy anticipates filling an Assistant Professor position beginning June 27, 2016. Desired experience includes mechanics of materials, aerospace structures, finite element analysis, fatigue and fracture, composite materials, structural dynamics, and experimental mechanics. The initial appointment will be for three years and successive reappointments of up to four years are possible. Responsibilities include teaching undergraduate core and majors' mechanical engineering courses to officer candidates and fulfilling departmental duties. The selected candidate will participate in academic advising, mentoring, accreditation reviews, and directing research in mechanical engineering.

An earned doctoral degree in Engineering Mechanics or Mechanical, Aeronautical, or Astronautical Engineering focused in structural mechanics with demonstrated expertise is required by the time of application. Essential qualities include integrity, industry, cooperation, initiative, and breadth of intellectual interests. Successful candidates will have a strong commitment to undergraduate teaching.

The US Air Force Academy is located just north of Colorado Springs, Colorado. It is an undergraduate institution that awards the Bachelor of Science degree in 27 disciplinary and interdisciplinary majors. Its mission is to educate, train, and inspire men and women to become officers of character, motivated to lead in the United States Air Force and in service to our nation. The student body consists of approximately 4,000 men and women representing every state and several foreign countries.

Requirements: Candidates must be a U.S. citizen. The selected candidate must complete a security investigation. Failure to meet the requirements of the investigation will be grounds for termination.

To Apply: Applications must be received by **November 30, 2015**. Go to www.usajobs.gov. Search for #16-10DFEM in the "Keyword" box, or type in "USAF Academy" in the "Location" box. Click "Search," then scroll down until you locate this position.

The U.S. Air Force Academy is an Equal Opportunity Employer.

UNIVERSITY of HAWAI'I® MĀNOA

Assistant Professor (Thermofluids: Energy)

Position number 0085353, University of Hawaii at Manoa (UHM), College of Engineering (COE), Department of Mechanical Engineering, invites applications for a full-time, general funds, tenure track, faculty position, pending position clearance and availability of funds, to begin approximately August 1, 2016.

The University of Hawai'i is a Carnegie doctoral/research-extensive university with a strong emphasis on research and graduate education. The Department offers B.S., M.S., and Ph.D. degrees in mechanical engineering, and its undergraduate program is ABET accredited.

For more information on college research themes, please visit our college web site at www.eng.hawaii.edu. The department has active research programs in renewable energy systems & sustainability, combustion, boiling and two-phase flow, multidisciplinary design and analysis optimization, biotechnology, biomedical engineering, space and ocean science & exploration, robotics, control systems, dynamical systems, nanotechnology, corrosion, and high-performance computing.

This faculty could potentially work with UHM School of Ocean and Earth Science and Technology, SOEST (e.g., HNEI: Hawaii Natural Energy Institute and ORE: Ocean and Resources Engineering) and also contribute to the UH-iLab, Makers, VIP, and Entrepreneurship programs of the College. This faculty can also contribute to the COE Research Clusters such as Renewable Energy and Island Sustainability, etc.

Duties: Teach and develop undergraduate and graduate courses in the area of thermofluids such as renewable or alternative energy, energy conversion and storage, heat and/or mass transfer as related to thermal or fluid systems. Develop externally funded research programs that result in publications in leading scholarly journals; present research work in leading scholarly conferences; supervise graduate students; teach via various distance delivery modes as required; and serve on departmental, college, and university committees.

Minimum qualifications: An earned Ph.D. (All-But-Dissertation, ABD, cases will be considered) in Mechanical Engineering or a closely related field. The candidate should have a background in an emerging research area related to thermofluids with expertise in energy. Candidates must also show a strong commitment to teaching excellence and mentoring at the undergraduate and graduate levels.

Pay range: Commensurate with qualifications and experience.

To Apply: Only electronic applications are accepted. Applicants should follow the instructions at http://www4.eng.hawaii.edu/apply for submission instructions (The applicants should submit a cover letter specifying the position and the research area; a statement on their research interests, activities, and plans; a statement on their teaching philosophy, interests, and plan; a curriculum vitae detailing research and teaching accomplishments; copies of up to 4 relevant publications; and the names, addresses, e-mail, and telephone numbers of 4 references). For more information on the Department, please visit our website at www.me.hawaii.edu.

Inquiries: Professor Mehrdad N. Ghasemi-Nejhad, Chair, 808-956-7560, nejhad@hawaii.edu.

Review of applications will begin on February 1, 2016 and will continue until the position is filled.

The University of Hawai'i is an equal opportunity/affirmative action institution and is committed to a policy of nondiscrimination on the basis of race, sex, gender identity and expression, age, religion, color, national origin, ancestry, citizenship, disability, genetic information, marital status, breastfeeding, income assignment for child support, arrest and court record (except as permissible under State law), sexual orientation, national guard absence, or status as a covered veteran.

Individuals with disabilities who need a reasonable accommodation for the application or hiring process are encouraged to contact the EEO/AA coordinator(s) for the respective campus.

Employment is contingent on satisfying employment eligibility verification requirements of the Immigration Reform and Control Act of 1986; reference checks of previous employers; and for certain positions, criminal history record checks.

In accordance with the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act, annual campus crime statistics for the University of Hawai'i may be viewed at: http://ope.ed.gov/security/, or a paper copy may be obtained upon request from the respective UH Public Safety or Administrative Services Office.

PENNSTATE 1855

FACULTY SEARCH IN NUCLEAR ENGINEERING

The Department of Mechanical and Nuclear Engineering at The Pennsylvania State University is seeking outstanding applicants to fill a tenure-track position in nuclear engineering. The areas of interest include, but are not limited to: reactor engineering, reactor physics, reactor safety, fuel management and nuclear fuel cycle.

The Mechanical and Nuclear Engineering Department is home to 50 faculty conducting in excess of $27M per year of funded research across a broad spectrum of traditional and emerging areas. The Department offers separate B.S., M.S., and Ph.D. degree programs in both mechanical engineering and nuclear engineering. Further information on the Department can be found at: http://www.mne.psu.edu/. The faculty in the Nuclear Engineering Programs conduct state of the art research in the fundamental areas of nuclear engineering discipline with extensive collaborations across campus. In addition to concentration on nuclear science and nuclear security, the program has a strong emphasis on nuclear power with close research connections to industry and government and through many international partnerships. The program benefits strongly from the Breazeale Nuclear Reactor on campus, and the associated Radiation Science and Engineering Center for education and research. The nuclear engineering program has a vibrant resident student population, both graduate and undergraduate, and a well-established and very successful distance education graduate program.

Qualifications for this position include a doctorate in nuclear engineering or a related field. Applicants should have demonstrated outstanding scholarly research experience and teaching interests in nuclear engineering. Successful candidates will be expected to teach courses at both the undergraduate and graduate levels, to develop an internationally-recognized, externally funded research program, and to contribute to the operation and promotion of the department, college, university, and profession through service. Nominations and applications will be considered until the positions are filled. Screening of applicants will begin on December 1, 2015. Applicants should submit a statement of professional interests, a curriculum vitae, and the names and addresses of four references. Please submit these three items in one pdf file to https://psu.jobs/job/59677.

CAMPUS SECURITY CRIME STATISTICS: For more about safety at Penn State, and to review the Annual Security Report which contains information about crime statistics and other safety and security matters, please go to http://www.police.psu.edu/clery/, which will also provide you with detail on how to request a hard copy of the Annual Security Report.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.

R&D Engineers

Creare, a leader in cutting-edge R&D, conducts applied research, develops new technologies, and provides analysis, design, experimental, computational, product, and consulting services to industry and government. Project teams are small and engineer-led, and individuals have significant opportunity to pursue areas of technical interest.

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- **Applied Mechanics**
- **Manufacturing Processes**

We are looking for exceptional engineers with the passion, creativity, and skills to pursue varied technical research in a multi-disciplinary environment.

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RECRUITMENT

CONSULTING

HALL, CHIU ARE NEW JOURNAL EDITORS

Two ASME journals recently named new editors. The *Journal of Turbomachinery* is now edited by **Kenneth C. Hall** of Duke University in Durham, N.C. **Wilson K.S. Chiu** of the University of Connecticut in Storrs is the editor of the *Journal of Fuel Cell Science and Technology*.

The term for each editor is five years.

Hall is a recognized expert in computational unsteady aerodynamics and aeromechanics of turbomachinery, with additional research interests in helicopter aerodynamics, flapping flight, and dynamics.

He is a former vice president and treasurer for the ASME International Gas Turbine Institute.

Hall's position at Duke is Julian Francis Abele professor of mechanical engineering and materials science in the Edmund T. Pratt Jr. School of Engineering, and he is an ASME Fellow.

The *Journal of Turbomachinery* publishes peer-reviewed technical papers on subjects including the fluid dynamics, heat transfer and aeromechanics technology associated with the design, analysis, modeling, testing, and performance of turbomachinery, with an emphasis on gas-path technologies associated with axial compressors, centrifugal compressors, and turbines.

A professor of mechanical engineering, Chiu is also an ASME Fellow. His research focuses on heat and mass transfer with chemical reactions, with applications to materials for carbon nano-materials, photonics, and semiconductors, as well as such sustainable energy applications as fuel cells, batteries, and electrolysis.

The *Journal of Fuel Cell Science and Technology* focuses on the science, engineering, implementation, and manufacturing of fuel cells of all types, as well as fuel cell case studies involving examples of real-life systems.

MASTERCLASS COURSES TO BE OFFERED AT IMECE

ASME Training & Development will present four special MasterClass courses this month during the ASME International Mechanical Engineering Congress and Exposition in Houston. The four advanced-level courses will be offered from Nov. 15 to 18 at the Hilton Americas and the George R. Brown Convention Center.

Led by industry experts and ASME codes and standards leaders, ASME MasterClass courses are practical training sessions for experienced professionals that emphasize learning through the discussion of real world case studies and practical applications. MasterClass instructors lead in-depth sessions that address current issues and best practices to inspire interactive discussions and group knowledge-sharing.

THE COURSES ON OFFER ARE:

- "Verification and Validation in Scientific Computing," covering modern terminology and effective procedures for verification of numerical simulations, validation of mathematical models, and uncertainty quantification of nondeterministic simulations. The class will be presented by **William Oberkampf** and **Christopher Roy**.
- "Fatigue Analysis Requirements in ASME Boiler and Pressure Vessel Code Section VIII, Division 2 – Alternative Rules," providing a thorough examination of the techniques used in fatigue analysis of pressurized equipment. **David Thornton** will present the course.
- "Run-or-Repair Operability Decisions for Pressure Equipment and Piping Systems," offering a comprehensive review of the rules and application of the ASME codes and standards in making run-or-repair operability decisions for pressure equipment and piping systems. The course will be presented by **George Antaki**.
- "Bases and Application of Piping Flexibility Analysis to ASME B31 Codes," providing an in-depth examination of the rules and practical application of piping analysis requirements in the ASME B31.1 Power Code and ASME B31.3 Process Piping Code. **Jim E. Meyer** is the instructor.

The four ASME MasterClasses in Houston are not included in the full registration for IMECE 2015, so separate registration is required to sign up for the courses. Although MasterClass registration does not include access to the IMECE technical sessions, course registrants will be able to enter the IMECE exhibit hall and attend the opening reception, opening keynote session, and the conference-wide plenary sessions.

For more information on the MasterClass Series training event in Houston, or to register, visit http://www.asmeconferences.org/IMECE2015/MasterClasses.cfm.

To learn more about the ASME MasterClass Series and other upcoming programs, visit go.asme.org/masterclass. ME

GENZALE RECEIVES YOUNG INVESTIGATOR AWARD

The Army Research Office Young Investigator Award has been given to **Caroline L. Genzale**, assistant professor in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta. Genzale, an ASME member, received a three-year grant for a project involving the development of a new kind of high-resolution imaging diagnostic to study the mechanisms of atomization in high-pressure fuel sprays for diesel combustion engines. The new technique employs pulsed light-emitting diodes in multiple colors to record the spectral signature of the fuel-air mixture before it is combusted. ME

Caroline L. Genzale

D.C. INTERNSHIP OPPORTUNITY STILL AVAILABLE TO STUDENTS

ASME is currently accepting applications from engineering students who are interested in representing the Society in the 2016 Washington Internships for Students of Engineering program.

Ranked as one of the best internships in the U.S. by the *Princeton Review*, WISE offers an opportunity to third- and fourth-year engineering students to spend the summer of 2016 in Washington, D.C., learning about the interaction of technology and public policy.

ASME is now accepting applications for its 2016 WISE intern. The ASME application can downloaded at http://www.wise-intern.org.

The application deadline is December 31, 2015.

WISE interns spend nine weeks learning how government officials make decisions on complex technological issues and how engineers can contribute to legislative and regulatory public policy decisions. At the end of the nine weeks, each intern submits a public policy paper on a topic of interest and presents his or her findings.

MOORE MEDAL FOR LING

The Society for Standards Professionals has awarded **June Ling**, retiring deputy executive director of ASME, with the 2015 Leo B. Moore Medal for distinguished contribution to standardization.

The Leo B. Moore Medal is the most prestigious award conferred by the Society for Standards Professionals. Key factors in the selection of recipients include "highest achievement, extraordinary contribution, and distinguished service in standardization" and advancing standardization "through original research and writing, creative application and development, or professional and public service."

BATHIE RECEIVES NCEES AWARD

ASME Life Fellow **William W. Bathie** received the 2015 Distinguished Examination Service Award from the National Council of Examiners for Engineering and Surveying at the council's annual Awards and Installation Gala in August.

The award recognizes NCEES exam program volunteers for their contributions to the program and their efforts to improve and advance the council's licensing exams. Bathie began volunteering with NCEES in 1979, and has written and reviewed questions, assembled and graded exams, and participated in studies to update specifications and to establish passing scores.

Bathie has been a member of ASME for 50 years and has served in a number of positions with the Society, including vice chair of the Committee on Membership, member of Fellows Review Committee, and vice president of ASME's former Region VII. He received the ASME Dedicated Service Award in 1998.

ASME FELLOWSHIP LAUNCHED FOR DIGITAL MANUFACTURING

The Digital Manufacturing and Design Innovation Institute in Chicago has partnered with ASME to provide a new fellowship opportunity.

The ASME Advanced Manufacturing Fellow will be expected to provide scientific, technical, and intellectual leadership, and analytical support to the institute, and will develop the curriculum and materials for a "Digital Manufacturing and Design 101" course, among other duties.

The aim of the institute is to accelerate the adoption of digital manufacturing and design technologies in the U.S. manufacturing sector. It does this through steps such as facilitating the development and deployment of digital manufacturing and design technologies and by linking and integrating U.S. companies with existing industrial and economic development resources.

More information on the fellowship is available at http://ppec.asme.org/latest-news/asme-advanced-manufacturing-fellowship-opportunity-digital-manufacturing-design-innovation-institute/.

ANOTHER MASTER OF FLIGHT

HUMMINGBIRDS MAINTAIN STABILITY IN CONDITIONS WHERE MAN-MADE AIRCRAFT WOULD STRUGGLE TO SAY ALOFT.

Flight control of small unpiloted air vehicles, especially in bad weather, is a goal of Sridhar Ravi of Harvard University. Ravi has studied bumblebees because, although they are very small, their flight remains stable in wind-induced turbulence. Tiny mechanical drones haven't yet advanced to that stage.

Ravi has now turned his attention to another small, expert flier, the hummingbird. Ravi, a post-doctoral fellow with an aerospace degree, works in the Department of Organismic and Evolutionary Biology in the Combes Lab at Harvard's Concord Field Station.

He and his team of researchers working with Stacy Combes, the lab's principal investigator, conducted intensive research to observe what the bumblebee does to keep itself steady in the air when the wind blows. The study concluded that, while bumblebees have learned to fly stably in turbulence, they still experienced significant translational and rotational fluctuations as compared to flight in smooth flow.

The new study was conducted through collaborations between scientists at RMIT University in Australia and at Harvard. Its observations include the hummingbirds' use of their tails to help maintain stability.

The birds are excellent flyers, able to contend with the challenges posed by adverse winds in the environment. Bees and hummingbirds are both capable of hovering in unsteady winds.

The study presented hummingbirds with smooth winds and highly turbulent winds and assessed the head, body, and tail kinematics of the birds. Ravi said that the hummingbirds maintained incredibly stable head position (moving less than 500 micrometers even when the wind was gusting). The birds also displayed very high flexibility in their wing kinematics and could change the parameters of their flapping cycle independently for each wing.

According to the study, the left wing might do something completely different from the right wing. On average, the birds increased their flapping frequency and flapping amplitude, something they do when flying at high speeds.

The study was able to take drag measurements on the bodies of the hummingbirds and found that in order to hover in turbulence the birds traded off flight efficiency for stability. They fanned their tails, an action that increased drag, but also gave them additional stability in flight.

A video taken for the study shows the birds "powering" their way through the turbulence. When they fan out their tails, they can also to rotate them to arrest rapid disturbances. On average the birds also maintained a higher tail fan angle in turbulent winds that increased their stability.

Ravi said that the complex movements and orchestrations of the tail kinematics allow the hummingbird to successfully maintain stable flight in conditions where man-made aircraft would struggle to say aloft. The wing movements were just too complex to mimic or interpret as of now.

Ravi said that his team's research has enhanced their understanding of animal flight. He said some of their observations may be transferred to the design of unmanned aerial vehicles, perhaps by developing a mechanical tail, for example, that can serve the same purpose as that observed on hummingbirds. ME

JAMES PERO

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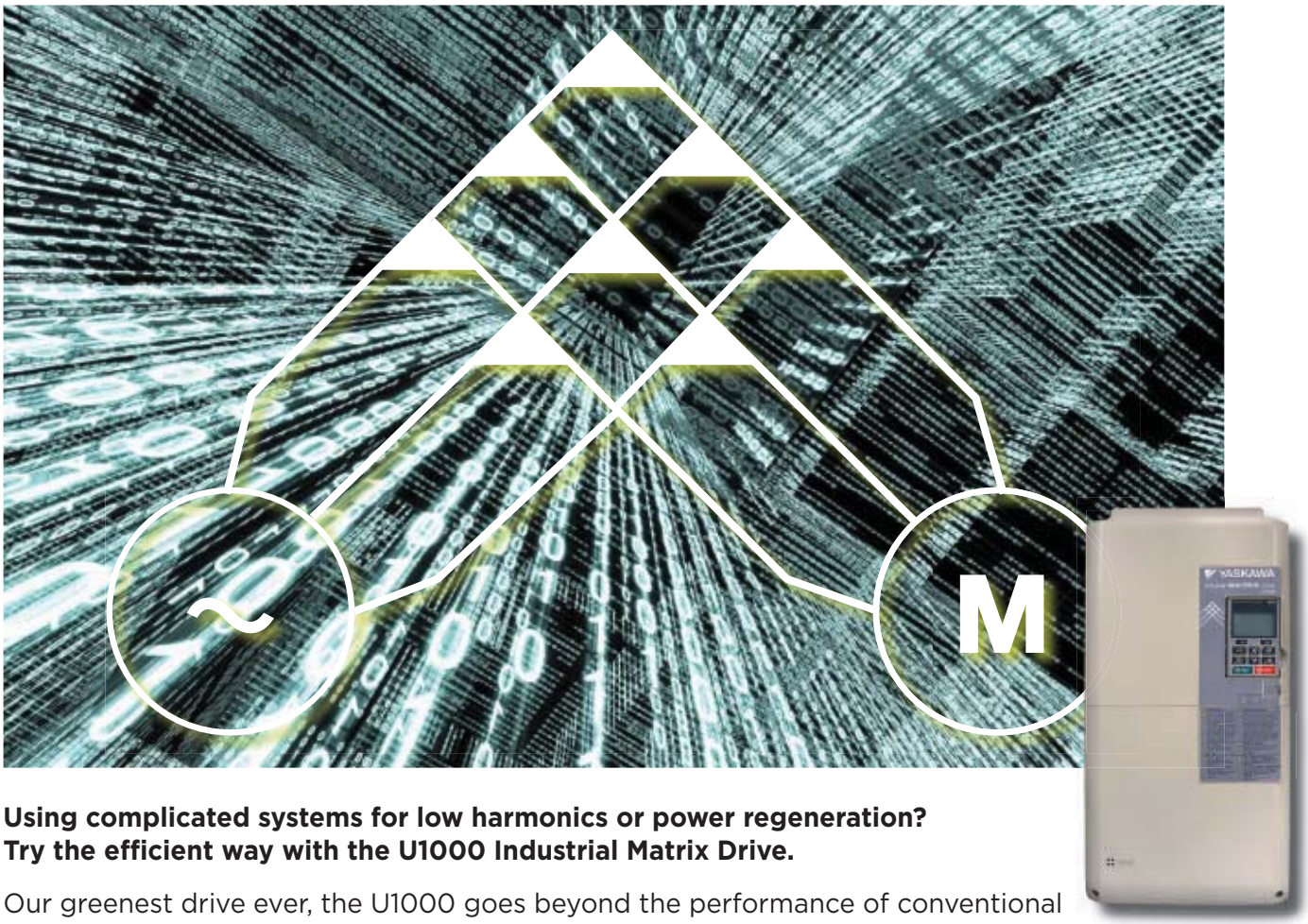

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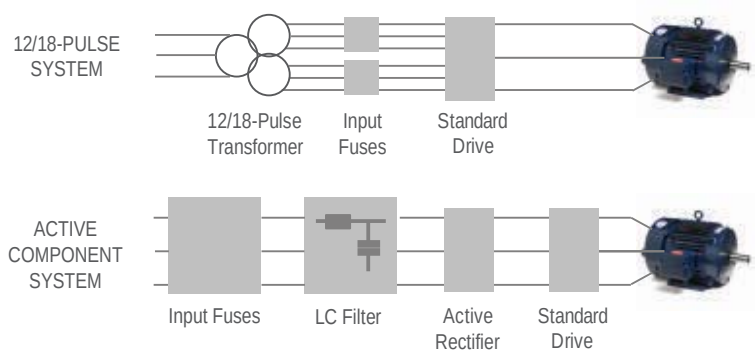

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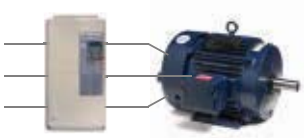

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